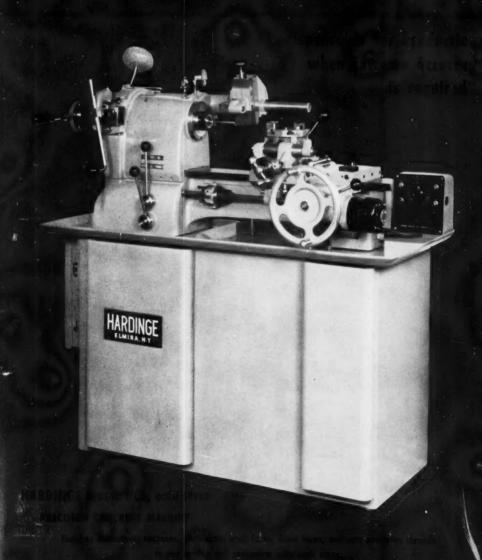
# Modern Machine Shop



# how to grind a BORE and FACE at the same time

### Heald Model 271 Size-Matic permits grinding both surfaces in the time normally required for bore grinding alone

This setup permits end facing and bore grinding at a single chucking, producing end faces square with bores. What's more, it does both jobs without adding to the normal bore grinding time—which means a big saving in total time per part. It is best applied on long production runs.

The facing wheel spindle is mounted on antifriction slide bars, and is driven by a special motor with an extended stator. As the table reciprocates, the facing wheel is held stationary against the work and the driving rotor remains in the magnetic field of the stator, which moves back and forth with the table. An automatic feeding stop controls the face grinding depth, with provision for wheel face-wear compensation.

The face is ground during the semi-finish grinding of the bore. While bore is being finish ground after wheel dressing, facing wheel is held away from work by face feeding stop.

This is another example of how Heald engineering can help to increase your production and improve product quality. Remember — when it comes to precision finishing, it pays to come to Heald.

TABLE Simplified schematic diagram CHUCK of grinding wheel arrangement which permits the bore grinding wheel to reciprocate while the face grinding wheel is held BORE forward against the work. WHEEL BORE-GRINDING WHEELHEAD FACE GRINDING WHEELHEAD ON ANTI-FRICTION SLIDE FACE GRINDING WHEEL FACE FEEDING STOP SLIDE BAR FACE FEEDING STOP CONTACTS SLIDE BAR TO CONTROL DEPTH OF FACE IN PRIMARY POSITION-AND TO HOLD WHEEL CLEAR OF WORK IN SECONDARY POSITION ON FINISH GRIND



INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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Branch Offices Chicago . Cleveland . Dayton . Detroit . Indianapolis . New York

VOLUME 25 NUMBER 7 DECEMBER, 1952

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# Machine Shop

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### Landmaco Machine Threads Bell-shaped Gas Cylinder Collars

HARRISBURG Steel Corporation was interested in securing a more productive and economical means for threading stamped steel gas cylinder collars. Their threading problem arose mainly from the unusual bell shape of the workpiece (Fig. #1), which made chuck-

To selve their problem a 11/2" LANDMACO Threading Machine was furnished equipped

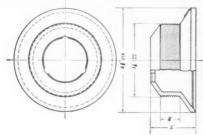


FIG. 1

with a special work holding fixture. The fixture (Fig. #2) is bolted to both vise jaws and thus rendering the vise jaws immovable, achieving the desired results of a solid carriage front. The gas cylinder collars are slipped over the arbor of the fixture and abutted against the circular abutting plate. Three semi-round drive keys, which fit into pressed key ways in the bore of the workpiece, prevent it from rotating on the arbor while under cut.

The die head supplied with this machine was a 11/4" Lanco Internal Trip Heat Treated Head.



(Fig. #3) Special Oversize chaser holders were provided for cutting a 31/4" diameter, 11 pitch, U.N. form thread 15/16" in length. Internal tripping, by which the workpiece opens the die head, assures the same thread length on each collar regardless of their variance in height. It



FIG. 3

also prevents any possibility of chaser breakage or die head damage by running the workpiece too far into the die head while threading. The bell shaped design of the trip bar facilitates the alignment and holding of the collar on the work holding fixture while under cut.

Although special oversize chaser holders were furnished for this threading job, the chasers used in these holders were standard 11 pitch, U.N. form chasers. These chasers were supplied from our large chaser inventory and can be replaced immediately when the need arises. Usage of these chasers is not restricted to the diameter for which they were provided. They may be used for any diameter within the range of the die head by using proper chaser holders and if the thread form and pitch remain constant.

Now in operation at Harrisburg Steel, this machine has increased production and reduced threading cost on gas cylinder collars to their complete satisfaction. This is but one example of the many special work holding fixtures designed by Landis which enable the production of quality threads on unusual workpieces.

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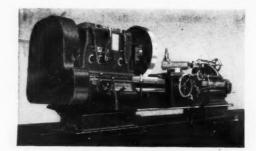
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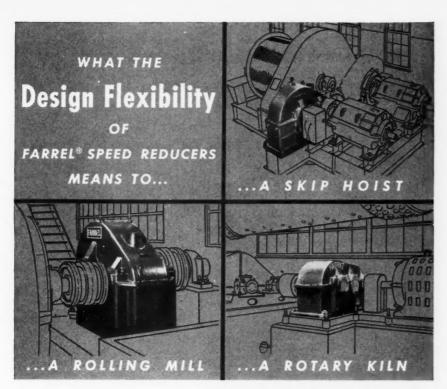
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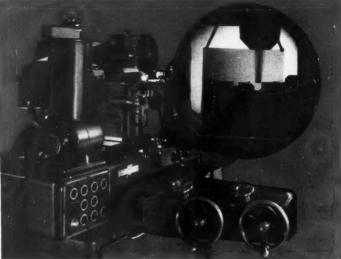
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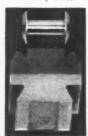
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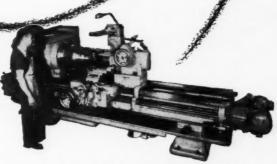
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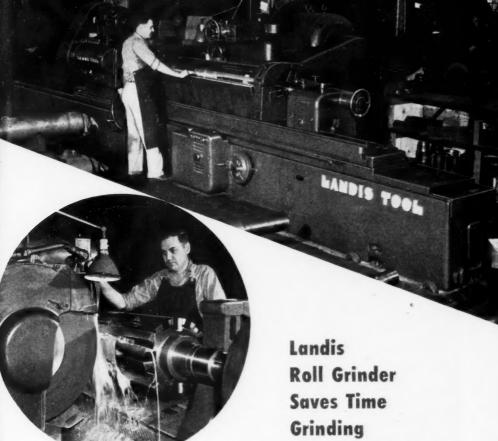
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12



#### WORK DATA

Machine: Landis 24" x 144" Type FR Roll Grinder Stock Removal: .025" on main diameter Tolerance: Body Diameter, .002" Taper Gauge to Face of Cylinder, ± .001" Time: 6 hours floor-to-floor



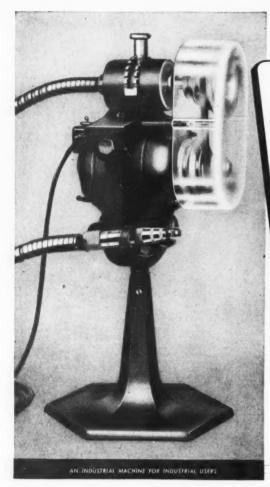
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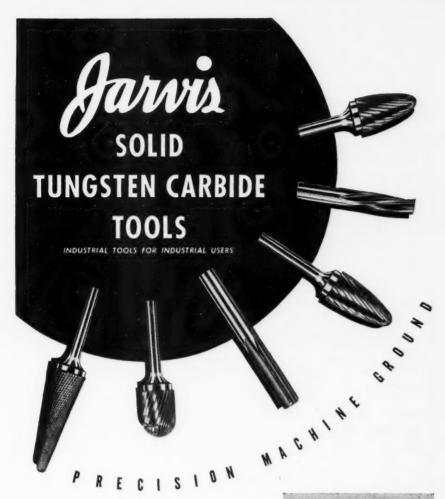
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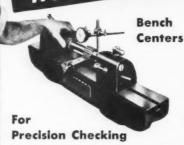
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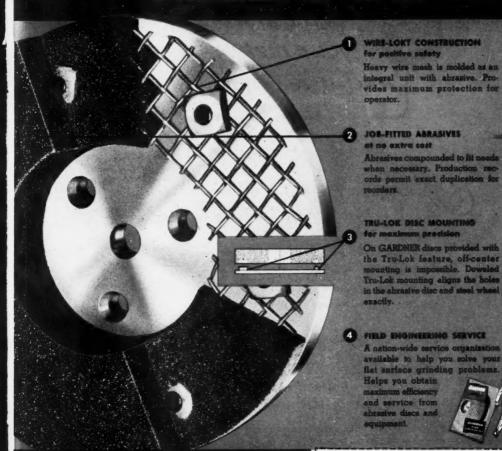


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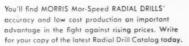


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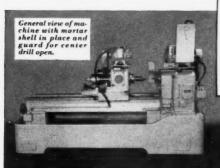
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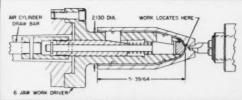
Save time and reduce manual operations to an absotute minimum.

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## MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-owing PEOPLE" SENECA FALLS, NEW YORK





# MODEL "CS" So-swing CENTERING MACHINE MAINTAINS UNIFORM WALL THICKNESS IN PROJECTILE TURNING

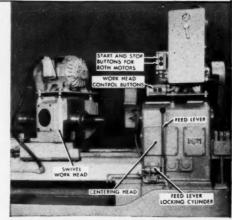
**Problem:** To center forged shells concentric with bore and to hold center depth in relation to bottom of cavity.

Solution: A standard Model CS Automatic Centering Machine equipped with a special revolving Swivel Head was selected for this job. This work head, shown swiveled to the loading position in the close-up illustration, provides ample clearance for loading and unloading shells from the long centering arbor which extends the full depth of the shell.

The work head spindle revolves at slow speed while the center drill revolves at its own correct drilling speed. This combination provides the most accurate method of centering hollow parts.

The work is held and centered on a six-jaw, air-operated expanding driver, shown in the line drawing. The three jaws near the open end are positively operated by the air cylinder, while the three jaws located near the bottom of the bore are operated by heavy spring tension to compensate for any variation in the diameter of the rough bore.

The Model CS Automatic Centering Machine is entirely automatic...the operator merely places a shell



on the driving arbor and pushes the Work Head control push button. This starts an automatic sequence of movements consisting of closing the chuck jaws, swiveling and locking the Work Head for proper alignment, and finally closing the air clutch for starting the Work Head Spindle. The completion of these movements releases a lock on the feed start lever which is now pushed by the operator to start the machine cycle. At the end of the cycle, the machine stops automatically with the Work Head swiveled to the loading position, the spindle stopped and the driving jaws released. The operator simply removes the finished part and replaces it with a rough part. The motors on both the Work Head and Centering Head revolve continuously, even during the loading part of the cycle.

The illustrations show the centering operation on an 81mm Howitzer shell but other types and sizes of shells may be centered simply by changing the work arbor.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH So-swing

millions of parts

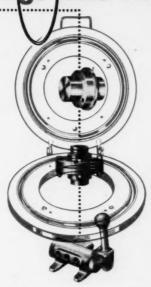
Chatter-free turning, smooth feeds, and rigid construction of this LeBlond 16" Heavy Duty Engine Lathe spell precision plus at Linear Incorporated of Philadelphia. Die orientation is insured by turning and boring mating diameters to .0005" tolerances. Flatness of faces is within .001" and roundness of cavity section is held to .001" of perfect circle. Material: Timken Graphitic MO; tool: high-speed steel.

are married with rings like these

Industry needs sealing rings to "marry" millions of parts against leakage of air, liquid, and gas. Seals, for example, like the rubber "O" rings made by Linear Incorporated of Philadelphia. They're vital to the successful operation of hydraulic mechanisms, air-operated devices, and chemical processing equipment . . to name just a few applications. And industry says, "Make these sealing rings to precision tolerance for non-leakage. Deliver the millions we need at low cost."

Linear experimented... found that "O" rings with the required finish and roundness could be mass-produced easily enough... but to turn them out at low cost demanded virtual elimination of hand-finishing operations. The problem called for dies made to tolerances that would deliver cross-sectional roundness conforming to nearly "perfect circle," mating diameters so accurate that perfect die orientation could be achieved.

Then Linear installed their new 16" LeBlond Heavy Duty Engine Lathe. This profit-building lathe is saving expensive toolroom time and delivering cavity finish on Linear's dies as fine as 10 microinches, mating diameters to the required .0005" whisker of tolerance, cross sectional roundness within .001" of perfect circle. Costly diefinishing time at Linear is down . . . flash-removing second operations on "O" rings are at a bone-bare profitmaking minimum. It's a case of chatter-free turning, smooth-as-silk feeds, and rigid construction.



LeBlond features like hardened and ground self-compensating steel bed ways, totally enclosed quick-change box, one-piece apron and a host of others will insure Linear a lifetime of this same smooth-turning performance.

Whether you need unfaltering accuracy or high output rapid production, there's a LeBlond lathe that will fill the bill. Your nearby LeBlond distributor will tell you about our complete line. Call him or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin HD125 E for more information on the 16" LeBlond Heavy Duty Engine Lathe

turned faster by





1. High Speed Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

 2. Integrally welded to make a fast-cutting, long lasting compositive blade that is positively unbreakable.

With greater accuracy, higher production and lower cost per cut, come the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—they will not shatter.

greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MAR-VEL design feature) and cannot be overcome by

work resistance. Heavier feeds and greater speeds

are practical without "run out."

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary high speed steel blades.

#### ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

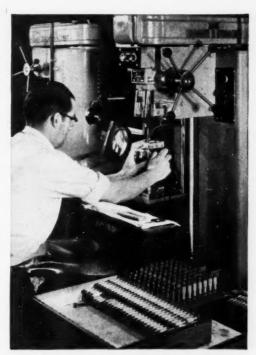
5700 BLOOMINGDALE AVENUE

CHICAGO 39, ILLINOIS



All Lufkin Chrome-Clad Micrometers now tapped on Warner & Swasey Tapping Machines





Warner & Swasey No. 11 Precision Tapping and Threading Machine in use at Lufkin Rule Company, Saginaw, Mich.

THE NAME, LUFKIN, has long been associated with extreme accuracy by users of precision measuring instruments. However, many man-hours of selective assembly were required to assure such accuracy in Lufkin Micrometers—until Warner & Swasey helped simplify and speed up their production.

Now Warner & Swasey No. 11 Precision Tapping and Threading Machines tap the high precision threads necessary in the hub and in the thimble of the micrometer. They perform each of these tapping operations in one pass, where three were previously required. And Warner & Swasey's positive lead screw principle maintains an accurate and constant lead control in these threads. No longer must an operator "feel" his way into the work by hand, or risk damage to the finished threads on withdrawal.

But of particular importance to Lufkin, operators can now qualify the starting positions of the taps so the "zero" mark on the micrometer's thimble matches perfectly with the reading lines on the hub when assembled. This drastically reduces the time-consuming selective and individual fitting of thimble to hub formerly necessary.

Where your work requires extreme threading accuracy on a production scale, call in your nearest Warner & Swasey

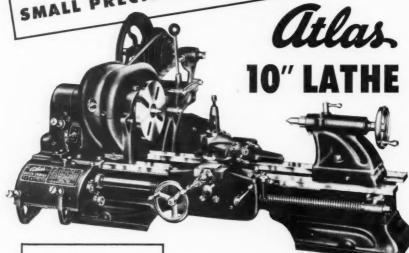
Field Representative.
He'll explain the many unique features of the No. 11 Precision Tapping and Threading Machine, and show you how it can improve your tapping operations.



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS, AND TAPPING MACHINES

# LOW COST LATHE -Timken Bearing Equipped!

CUTS PRODUCTION COSTS ON SMALL PRECISION PARTS!



### **Atlas** Features

- ★ Timken Tapered Roller Bearings
- ★ 16 Spindle Speeds 28 to 2072 RPM
- \* Precision-Ground Bed
- ★ Power Cross and Longitudinal Feeds

Today's best 10" lathe value by every standard is the Atlas "Quick-Change." It's the only 10" lathe with Timken tapered roller bearings. Wide thread, feed, and speed ranges provide extreme versatility—and it is built to handle 24-hour production runs week after week. New Atlas bed turret, lever-type carriage turret, and collet chuck convert the Atlas into the lowest cost turret lathe available. Send for latest catalog and literature.

### ATLAS PRESS COMPANY

1212 N. PITCHER ST., KALAMAZOO, MICHIGAN

DEPENDABLE QUALITY TOOLS SINCE 1911

Red Shield says: "You're entitled to the best-Use STANDARD REAMERS" Standardize and Save With Standard Red Shield Metal Cutting Tools, There is a Standard

### STANDARD TOOL CO. CLEVELAND 14, OHIO

New York • Detroit • Chicago • Dallas • San Francisco



THE STANDARD LINE: Twist Brills . Reamers . Taps . Bies . Milling Cutters . End Mills . Hobs . Counterbores . Special Tools

Distributor Near You and Ready to Serve You.



# Saves Time on deburring, facing, chamfering, center drilling, reaming operations . . .

Designed to speed tube, pipe, and rod end-finishing work of any size or length up to 2" diameter. Has a new-type chuck and clamping unit, automatic swing-type stock stop, interchangeable jaw inserts, multiple tool holders, precision spindle bearings, ½ hp. motor, 8-speed sheave. Portable, weighs only 170 lbs. Fast, easy to operate, has quick change-over features. Forward movement of operating lever, clamps piece, removes stock stop, feeds work to cutters. Operator always has one hand free for loading. Saves time. Typical production: 400-500 tube ends per hour. Speeds output.





Get more facts today on this new cost-cutting tool. Larger models up to 5" capacity also available.

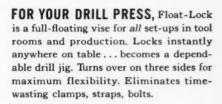
For long-run work ask for data on semi-automatic models with foot switch control.

# position material securely

### -in SECONDS!

### AMF FLOAT-LOCK SAFETY VISES

extend the usefulness of your drill presses and band saws. Reduce material spoilage, prevent tool damage...save money. Insure fast, safe, accurate work.



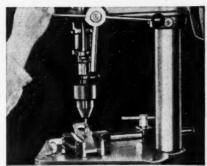
FOR YOUR BAND SAW, Float-Lock safely and securely holds all shapes and thicknesses of materials. Cutting to close tolerances made easy without hands touching material...simplifies compound angle cutting. Ideal for automatic chain-feed operation.

Order from **your industrial supply distributor** and write for illlustrated folder to: Wahlstrom/Float-Lock Sales Dept., American Machine & Foundry Company, 511 Fifth Avenue, New York 17, N. Y

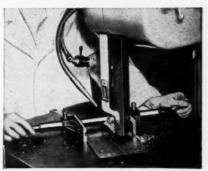




Ideal for centering and end drilling



Perfect for angle drilling



Cutting irregular shapes made easy



### Tips on Better Drilling

### CONVENIENCE FEATURES IN POV

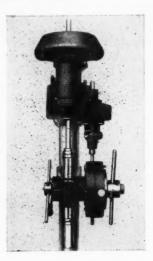
For the many manufacturers interested in the benefits of power feed drilling, we list below some of the features to look for. These features, which include freedom from trouble first and foremost, are built into the power feed designed by "Buffalo" as an extra in No. 16 Drills:

- · Simple control-feed engaged by feed motion of handle; raise handle to disengage.
- Positive gear and clutch type feed-no adjustments, no attention required other than occasional oiling.
- Both depth dial and depth control on front of machine.



Right, showing compact power feed unit available on "Buffalo" No. 16 Drills.

Left, 3-spindle "Buffalo" No. 16 Pedestal Drill, a rugged, accurate, easy handling machine for drilling up to 7/8" holes. Speed range is from 400 to 3000 rpm. Sensitive or power feed. WRITE FOR BULLETIN 2730F.





388 BROADWAY

MACHINE TOOLS

BUFFALO, NEW YORK

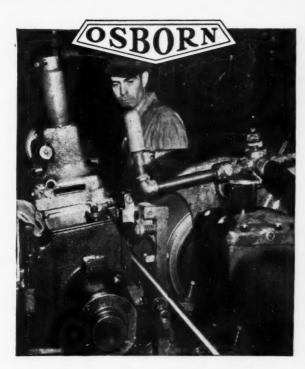
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

PUNCHING

SHEARING

CUTTING

BENDING





This waching does double duty. For removal of metal to close tolerance, it is a centerless grinder. Then, for finishing the surface to microsmoothness it is a centerless brusher. Its conversion takes only a few minutes.

In the operation shown above, nickel-moly steel rods for pumps, are being finished by an Osborn Fascut Brush. Prior to brushing, the same machine with a grinding wheel in place of the brush made a rough grind, taking off .006 inch, and a finish grind, taking off .002 inch. Results of the Centerless Brushing: Produces a smoother finish. Reduces wear in pump packing. Reduces corrosive action on rods; makes them last longer.

An Osborn Brushing Analyst helped develop this improvement. Ask your OBA to help you on all problems of cleaning and finishing! Call him today or write The Osborn Manufacturing Company, Dept. 897, 5401 Hamilton Avenue, Cleveland 14, Ohio.



OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



THE SET-UP. This shows the centerless grinding machine which also serves as a "centerless brusher". These pump rods vary from 1½ in. to 1½ in. diameter ... from 6 ft. to 36 ft. in length. Regulating wheel speed is 52 r.p.m.

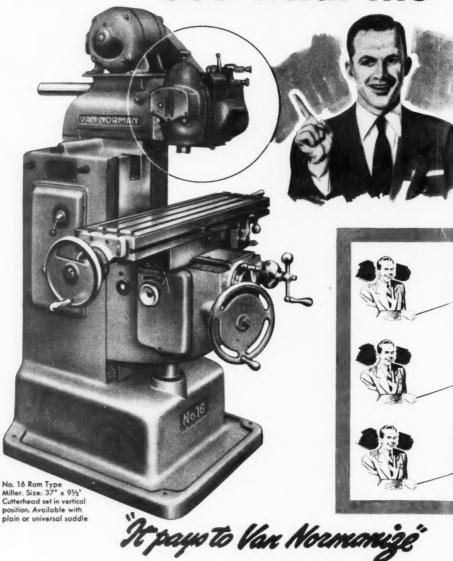


ANOTHER JOB. Here Centerless Brushing finishes cast iron pistons to microsmoothness. Simplifies assembly operations and increases life of pistons and cylinders. Output of this machine is '10,000 pieces per 8 hours.



TYPICAL PARTS which are being improved by Centerless Brushing include pistons, piston pins, bushings, tubing . . . any cylindrical parts. It can be applied to many sizes of parts and types of material on a mass production basis.

### "See what the



MODERN MACHINE SHOP

December, 1952

# Adjustable Cutterhead

## Can Do For You... and you will buy VAN NORMAN Ram Type Millers"

Van Norman Ram Type Millers give you every advantage for reducing milling costs. The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The movable ram plus the saddle cross feed increases the work range and capacity of these millers . . . enables you to handle larger work pieces with ease.

There is no waiting for single purpose ma-

chines because practically all milling operations can be accomplished on one Van Norman Ram

Type Miller.

Whether it is for tool room, production line, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers will increase your production and cut costs.

Here's how one Van Norman Ram Type Miller does the work of three single-purpose machines.



#### HORIZONTAL MILLING

With the cutterhead locked in horizontal position, the Van Norman Ram Type Miller is used for horizontal milling operation. Hardened stop set at the factory assures positive 0° setting.



#### VERTICAL MILLING

The illustration above shows the Van Norman Ram Type Miller as it is used for a vertical milling operation. Permanently fixed hardened stop permits easy, accurate positioning of the cutterhead at 90°.



#### ANGULAR MILLING

Here the adjustable cutterhead is set at 45° angular milling position. Horizontal, vertical or angular milling. All are easily performed on the Van Norman Ram

Van Norman Ram Type Millers are available in 6 basic models — No. 12, Table: 37"/" x 9%"; No. 16 Table: 37" x 9%"; No. 221 Table: 45" x 10"; No. 26 Table: 58" x 13"; No. 36 Table: 64" x 14"; No. 38 Table: 64" x 14";



AN COMPANY

SPRINGFIELD 7, MASSACHUSETTS



Track-type mounting for long, straight sweeps.

Carlton

Full round base gives ample space for large work pieces.

radial drills, special bases and revolving jigs

When you buy Carlton, you get the widest possible choice of radial drill capacity . . . for there are 4 different models with an almost unlimited number of column and arm sizes.

And special track-type mounting, seven different types of stationary bases, plain or uni-tilt tables, and revolving jigs . . . are available at slight additional cost . . . to help you increase your hole production.

For complete information, send today for descriptive bulletins.

Revalving jigs and fixtures give better drilling results faster.

THE CARLTON MACHINE TOOK CO. CINCINNATI 25, OHIO, U. S. A. THE CARLTON MACHINE TOOL

"Only one can be called the finest."

4-way base gives four work stations.





door component-built far langer die life Danly all steel 4-post special die set



## help Kask meet close production schedules!

Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

#### DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT -CALL YOUR NEAREST DANLY BRANCH

\*CHICAGO 50\_\_\_\_2100 South Laramie Avenue \*CLEVELAND 14\_\_\_\_ \_1550 East 33rd Street \*DAYTON 7\_ 3196 Delphos Avenue \*DETROIT 16 1549 Temple Avenue GRAND RAPIDS 113 Michigan Street N.W. INDIANAPOLIS 4... 5 West 10th Street \*LONG ISLAND CITY 1\_ 47-28 37th Street \*LOS ANGELES 54 Ducommun Metals & Supply Co., 4890 South Alameda

MILWAUKEE 2\_\_\_\_111 East Wisconsin Avenue \*PHILADELPHIA 40\_\_\_\_\_511 W. Courtland Street \*ROCHESTER 6\_ 33 Rutter Street

\*Indicates complete stack





DIE SETS ... STANDARD OR SPECIAL DIEMAKERS' SUPPLIES



### and PROLONGED MACHINE LIFE

It does not take long to ruin the accuracy of costly machine tools when poorly made, soft steel bolts of ordinary manufacture are used.

Boyar-Schultz SMB Bolts are precision made with heads at right angle to bodies, carefully machined to present a broad, flat surface to the upper surface of the T-slots. They are made from alloy steel forgings, heat treated for maximum properties and are tough and hard. Threads, class 3 fit will not easily strip or distort. SMB Nuts and Washers are specially made to give best results with SMB Bolts.

When compared with refinishing and trueing the bed of a machine tool, the cost of GOOD bolts is trifling.

2120 WALNUT STREET BOYAR-SCHULTZ CORPORATION . CHICAGO 12, ILLINOIS



Now you can have the advantages of quiet, simple, modern Hendey Electronic Motor Control on the Hendey 9" x 24" Tool and Gage-Makers' Lathe. These advantages include stepless spindle speeds from 25 to 3000 R.P.M. by potentiometer control of both field and armature of the 3 H.P. d-c motor. Exceptionally close speed control is obtained even under changing load. I.R. compensation gives full torque at low speeds over the complete armature control range. A full stop from

maximum speed is accomplished in approximately 1½ seconds. Starting, stopping or reversing, even at 3000 R.P.M., is accomplished smoothly and rapidly. This new drive is optional equipment, and full information is available in our new 9" x 24" Lathe catalog. Write for your free copy! It gives full details on the new drive as well as other features of the Hendey 9" x 24" Lathe, which guarantee precision output with minimum effort.



rotti endey

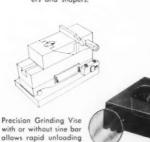
THE HENDEY MACHINE COMPANY
MAIN OFFICE & PLAINT TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit,
Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

#### Eliminate U-Clamps, Straps and Fingers

#### J & S All-Pulpose JAW CLAMPS

secure work-pieces quickly and rigidly easily adapted to box fixtures





New larger "Jumbo" and "Lil-Giant" clamps for use on larger-type planers.

#### NEW METHOD OF SECURING WORK-PIECES TO MACHINE TOOLS

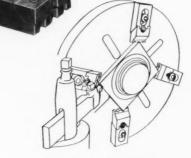
and exact relocating.

for Lathes, Planers, Milling Machines, Boring Millers, Jig Borers, etc. (9 different types including new Counter Clamp)

- Faster Set-up: One adjusting screw provides a 5-ton force to position and hold the work-piece.
- Stronger Grip: The inward and downward movement of the jaw clamp at a 45° angle gives a single, powerful clamping action easily applied and controlled.
- Less Obstruction: You can pass over the whole clamp 1" from the working surface of the machine face. No interference with reading or measuring tools.

J & S TOOL CO., INC.

645 W. Mt. Pleasant Ave., Livingston, N. J.



Typical lathe application. Standard clamp in use.



1000 1001 000,



DELIVERY FROM STOCK

---contains complete details an advantage applications. Types and sires available.

Backlet describing J & 5 "Fluidination Wheel Dressers, etc., also sent on request.



## Sands of Time.

As the Hour glass accounted for the passing of time the Bullard Mult-Au-Matics have, in many plants, established manufacturing time

schedules with an attendant record for time savings.

Whatever the pace, there is always manufacturing economy and efficiency in the Mult-Au-Matic Method.

Whether it is the keyed up pace for Defense or War or the milder pace of peacetime production, Mult-Au-Matics can be adapted to the requirements of the moment.



# THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

## EXCEL No. 6 PAYS BOTH WAYS

TOOL & CUTTER
GRINDING
HEADQUARTERS
in the smaller shop-

# EXTRA SHARPENING SERVICE in the larger plant—

An outstanding value in price and performance! The Excel No. 6 Universal Cutter and Tool Grinder will accurately sharpen reamers and milling cutters in a wide variety of shapes and sizes. A full line of attachments is available for a multitude of applications including cylindrical and internal grinding. Base optional.

Builders Sv of Precision Fa Grinders Ta for 78

 Swings work
 8" dia. x 16" long

 Face mill capacity
 12" dia.

 Table surface
 4" x 24"

PROMPT DELIVERY
FOR DEFENSE

OVEL
PRECISION
GRINDERS
BENTON HARBOR – MICHIGAN

DRILL
GRINDERS
CUTTER &
TOOL GRINDERS
HYDRAULIC & HAND
FEED SURFACE GRINDERS

Write for BULLETIN MM-122

# GISHOLT'S easier operation



saves you time and money ...

This 21,000 lb. machine requires no more operating effort than turret lathes ½ its weight. Despite its great power and rigidity for heavy-duty work, the new Gisholt 4-L is so fast and responsive, it can handle light work of both large and small diameters. With many machine functions entirely automatic, waste time is eliminated. Fatigue is reduced to a new minimum. Training time is shortened. Operator output is faster—more nearly constant throughout the day.

Hydraulic Speed Selector eliminates manual gear shifting. Spindle speed changes are made instantly by power without stopping the spindle or releasing the main drive clutch. Can be operated either direct or pre-set.

Central control panel eliminates manual effort. Provides responsive finger-tip, push-button control for start, stop, reverse, inching, chucking, and coolant supply. Automatic braking brings the work smoothly and quickly to rest.

Easy selection of feeds is provided in the new single dial type feed selector control, making a complete choice of feeds immediately available. Aprons are fully enclosed. Automatic lubrication assures easy movement of carriage.

The new Gisholt 4-L Saddle Type Turret Lathe provides 31%" swing over the ways, 27" swing over carriage wing, 9½" to 12½" spindle bores and 63" longitudinal working travel of turret carriage to accommodate an unusually wide range of work. Ask Gisholt engineers about this modern, easier operating Gisholt as applied to your specific machining requirements. New literature is available.

GISHOLT



THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

# Increases output 30% on grinding operations



In a routine check of production operations, a welding equipment manufacturer discovered a grinder operating well below the RPM recommended for the work being done.

Replacing this tool with a Buckeye 6,000 RPM vertical grinder resulted in an immediate increase of 30% in productive output on this grinding job. In addition, the lighter, more powerful Buckeye grinder helped improve product quality, reduce tool maintenance costs, employee fatigue.

All of which proves it's very important to select the right tool for the job—and very expensive to go on using older, less efficient tools.

#### what are you waiting for?

The right tool for your job may well be described in the Buckeye air or electric tools catalogs. We'd like to send you either—or both—without obligation, of course.



Portable Air and Electric Tools for Industry

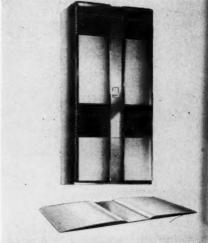
IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario

# The trend is to more stampings WITH BLISS PRESSES...





1200 14-gauge drip pans are drawn and formed daily in this Bliss press which has a 400-ton blankholder pressure and 200-ton plunger capacity.



Hard-to-make contours in this center-section stamping for a Weathermaker are drawn from 20-gauge steel at the rate of 1800 daily.

#### Versatile Bliss Hydro-Dynamic Allows Unusual Metal Design

A new 600-ton Bliss double-action Hydro-Dynamic press helps Carrier Corporation produce nice-to-look-at but toughto-make contours for its line of air conditioners.

Carrier's Vice President of Manufacturing reported that, "By varying ram, blankholder and cushion pressures and the draw cycle, we have been able to complete difficult drawing operations with sharp corners and small radii at the bottom... Actually, the press has exceeded our expectations."

Top performance? Of course-but it's all a matter of picking the proper press. It's what Bliss engineers mean by "the right press for the job."

E. W. BLISS COMPANY, CANTON, OHIO E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch effices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Tolodor, and Taronto, Canada. West Ceast Repre-sentatives: Macra Machinery Co., Los Angeles and San Fran



Top panel for window-model Room Air Conditioner has intricate contours, sharp corners and bottom radii. Yet Carrier was able to produce them at the rate of 1200 per eight-hour shift.

BLISS

PRESS IS MORE THAN A NAME ... IT'S A GUARANTEE!

## PIERCE THIS VARIETY OF SHAPES - AND MORE

- · without set up
- in sheetmetal or plate
- · with low cost tooling

this heavy duty turret punch press increases QUALITY at LOWER COST

#### Eliminate

- · excessive handling
- · layout and other time-consuming methods

16 to 24 punches and dies in turrets for immediate use.

One machine completes most jobs.

Work locating gauge pierces accurate finished



WIEDEM

MACHINE COMPANY

4219 Wissahickon Avenue . Philadelphia 32, Pa.

### DEPT. OF DEFENSE

work . . . by *LINDBERG* Induction Heating Units



L. A. Young Spring & Wire Corp., Detroit, Mich., use two 5 KW Lindberg Induction Heating Units for production brazing,

soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting requirements.

We can't tell you much about the manufacturing processes at the L. A. Young plant (due to security restrictions)... but we can tell you about the many rugged construction features of this equipment ... features which make it so dependable that the L. A. Young organization selected Lindberg Induction Heating Units for their important Department of Defense work. These points of design and construction will minimize costly breakdowns and aggravating work stoppages:

Filament voltage regulation transformers keep tube filament voltages at proper values regardless of line fluctuations. The end result . . . longer tube life.

Checklites:.. A system of indicating lamps instantly reveals any abnormal operating conditions...simplifies servicing.

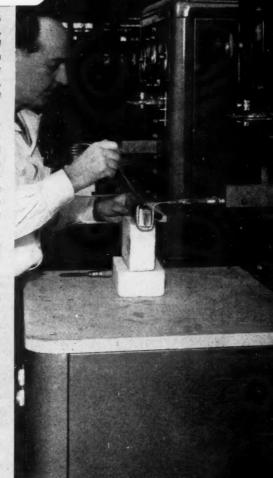
Work coil burn-out protection... An electrical interlock system makes it impossible to turn on power when cooling water is not flowing.

Long-life industrial tubes feature shortened internal structure . . . Kovar metal-to-glass Seals . . . heavy walled anodes.

Sealed tank capacitors are hermetically sealed against dirt and dust...require no servicing or refilling.

Investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

LINDBERG J



HIGH FREQUENCY DIVISION
LINDBERG ENGINEERING COMPANY,
2450 West Hubbard Street, Chicago 12, Illinois

Sure Spec Drill Rod

Finest Quality in

Sure Spec Drill Rod
is high grade

tool steel...comes
in manufacturer's
standard sizes
at low prices!

FLATS
from 1/4" x 1/4" to 1/2" x 1"

#### See! this easy purchase plan . . .

One of these safe, sturdy steel compartments designed to protect your drill red, is yours on this easy plan:

- You may get the cabinet or the floor rack free with an initial order of \$150 of Sure Spec drill rad.
- Or you may get a \$24.95 credit for the cabinet or a \$15 credit for the floor rack if your initial purchase of \$150 worth of Sure Spec Drill rad is within a 90-day period.

WRITE TODAY to our nearest office shown below for a comprehensive data book detailing all the facts about Sure Spec drill rad, such as sizes, analysis, uses and treating. Also, at your request, one of our sales engineers will call to discuss your particular drill rad requirements and quote prices.



#### With these safe, sturdy compartments to store and protect it!

Cabinet is all steel. Painted orange and black. Stacks 3-foot lengths. Hes 20 separate bins.



Floor rack is all steel with composite floor mat to protect ends. Painted arange and black. 20 separate compartments. Stocks 3 feat and longer lengths.



"for service dependable as the sun"

SOLAR STEEL CORPORATION

SUR



SPEC

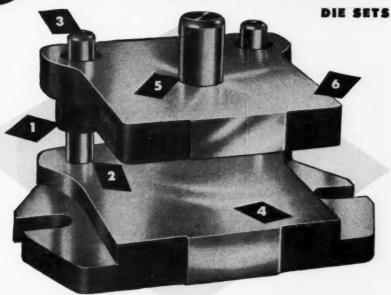
General Offices: UNION COMMERCE BUILDING, CLEVELAND, OHIO

See your local classified telephone directory for our nearest office address

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River Rouge, Mich. • Rochaster, N. • Tolede • Union, M. J. • Washington, D. C. • Warcaster, Mass.

# Freasons for buying.. PRODUCTO



- 1. Bushings have an absolutely uniform inside di-
- 2. New design die set gives added strength and assures accurate location of pin and bushing holes.
- 3. Accuracy of guide pins and bushings are checked on light guages reading to 50 millionths of an inch.
- 4. Parallelism and flatness held to close limits by rough machining prior to grinding.
- Shank, cast as integral part of semi-steel die set, can be inserted or welded on all-steel sets.

 Surface plates, accurate to within .0001", check flatness of ground surfaces and parallelism of die set.

To make an accurate die, an accurate die set must be used. For this reason, every Producto die set is an instrument of precision.

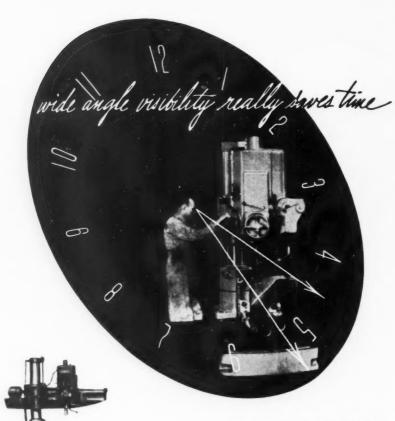
If planning a new die today, order your die set by the new Producto catalog — selection is easy, delivery is prompt.

THE PRODUCTO MACHINE COMPANY

For Precision Die Sets Fast Call . . .



ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.



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MACHINE TO OL COMPANY

'Round the clock—day after day—time savings pile up with Gilbert radial "comfort-level" operation. The operator can put the arm down (for comfort as well as minimized deflection) and still have full view of the work because (1) the spindle is close to the arm and to the front face of the head and (2) the bottom of the head extends only a short distance below the lower vee of the arm. All controls are right at band, easy to reach and finger-tip sensitive, keep fatigue down, production up.

WRITE FOR BULLETIN 349.

those who buy Gilbert buy Gilbert again

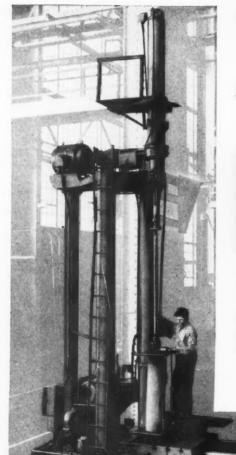




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1221 Tecony, Philadelphia 35, Pa., U.S.A. Canadian Factory: 2-20 Fraser Ave., Toronto 3, Ont.

higher production and lower costs.



#### fast

hone as much as 1/16'' of material at  $1\frac{1}{2}$  to 2 cu. in. per minute.

#### precision

tolerances as close as .0001 (±) on size, straightness and roundness.

CUT AWAY FERROUS & NON-FERROUS

# FULMER HONING MACHINES

Achieve amazing results each and every time! Cut labor costs ... setting up time ... any man can learn to operate FULMER HONING MACHINES in double-quick time. Photo taken in large steel mill.

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"What to Know about
Honing"

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1233 FIRST NATIONAL BANK BLDG.

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Chips Run as Large as Six Inches

Stock is removed by CUTTING instead of by slow, laborious abrasion. True internal bores from ½" to 40" diameter.

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American Drift Bushing Co., largest manufacture in the West specializing only in Drift Jig Bushings assures you of QUALITY, SERVICE and IMMEDIAT DELIVERY. A complete range of types and sizes an maintained in stock. Our staff of angineers will give erompt, officient service to any special or unusual drifting bushing problems. Demand the best—ask falamerican.

New catalog with helpful information and price now available. Seed for your free core.

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individual Vulcanaire

#### **DUST COLLECTING UNITS**

Use on surface and other grinders where any kind of grinding dust must be removed. Salvage diamond dust.

Inexpensive, compact units, with no moving parts.

Operated from your present air supply.

Installed in a few minutes, eliminating need for costly centrally located dust collecting systems.

The collector element is mounted on the side of the machine. Quickly cleaned, requiring no refills.

Vac-suction pick-up device (vacuum nozzle) is mounted on the grinding wheel guard or close to grinding wheel on other applications. This mounting permits constant contact with dust as the wheel is moved up or down.

A simple needle valve operates the unit, and can be shut off when machine is not in use.

Available in two sizes: 700 series for grinding wheels 7" dia. or less—200 series for wheels 2" dia. or less.

## "SALVAGE INDUSTRIAL DIAMONDS FOR DEFENSE"\*

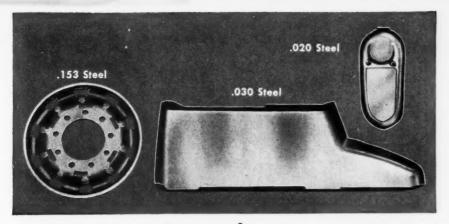
\*That is the title of the National Production Authority's booklet which describes the growing critical shortage of industrial diamond supplies.

The shortage will soon result in idle machine tools, and lost defense production unless we straightway begin to conserve grinding wheels and salvage diamond dust. The N.P.A. fully and helpfully explains the methods for doing these things.

Request this N.P.A. booklet on your letterhead and Vulcan will be glad to send it to you. You will also receive literature on the versatile Vulcanaire Dust Collector which promotes health in your plant and turns dust into money.

It's made by the makers of Vulcanaire
The jig grinding attachment

VULCAN TOOL CO. PRITZ AND HIGHLAND



# BREHM 401" TRIMMING

## Eliminates "Horn" and "Pinch" Operations

Slow, costly, multiple "horn" operations, and distorted edges due to "pinch" trimming can be eliminated by a Brehm Die. Operating on principles different than ordinary trimming methods, the Brehm "Shimmy" Die with angular cams causes the shearing edges to cut four ways in a single press stroke.

Materials, thickness, shapes and sizes look alike to a Brehm "Shimmy" Die. Whether it's stainless or mild steel, copper, brass, zinc, gold, fiber, silver, aluminum, rubber or plastic, Brehm users are assured of precise production results. Shapes can vary widely, whether a watch case, artillery case, refrigerator door, automotive or aircraft part. Clean, flat, burr free edges are assured. Edge contours can be straight or curved, with multiple notches and projections.

When model changes alter the part design, or if you wish to handle an entirely new part, you only need to substitute cutting adapters.

Write today . . . for a free catalog. Find out what a Brehm "Shimmy" Die can do—submit blueprints, or the part for full information or quotation.



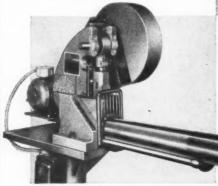
# Brehm TRIMMING DIES



# new benchmaster HALF-PRESS

LOW TONNAGE,
BIG CAPACITY
PROBLEMS!

Now you don't need to use big presses just to get work capacity. Benchmaster solves the problem with 4-TON HALF-PRESSES! Here are typical ways the HALF-PRESS cuts machine requirements:



#### NIBBLING SHELL CASE ENDS-

Shut height of conventional press was insufficient to accommodate tooling and work. Benchmaster HALF-PRESS is mounted to special base carrying rotating pilot stop. Shell case is now quickly nibbled to exact length with low cost press.

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#### SIZING SHELL CASE OPENINGS

Low tonnage, big vertical capacity is required. Note how the Benchmaster HALF-PRESS mounts on "T" shape frame, extending shut height to 18". Bolster is adjustable for various shell case lengths.

If you have big capacity, small tonnage jobs, investigate Benchmaster HALF-PRESSES! Our engineering services will help solve your problems and show you how to save money. Write, describing your work requirements!

benchmaster
MANUFACTURING COMPANY



FOR EXAMPLE

this LAPOINTE

H-P 40 SPECIAL

#### HORIZONTAL BROACHING MACHINE

has a LAPOINTE-ENGINEERED fixture that will accommodate all sizes of STATOR RINGS from 30" to 48" in diameter! Built with adjustable travel of 15", hydraulic index, hydraulic plunger and fully automatic lubrication, this fixture makes possible the precision broaching of 40 to 100 slots in stator rings at the high production speed of 35 seconds per slot!

#### What's your broaching problem?

Lapointe can give you the right answer, for Lapointe has the experience, the plant, the personnel to engineer your entire broaching job: machines, tools, and fixtures. You are always safe, when you leave it to LAPOINTE!



Write for illustrated technica Bulletin HP-8

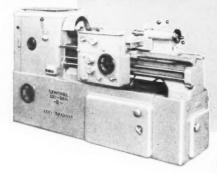
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HUDSON, MASSACHUSETTS . U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES



#### **DOUBLE** your thread production



# Day after day... Job after job

#### with the Cri-Dan "B"

It's no trick to double piece work production in spurts through concentrated effort. But with the CRI-DAN "B" single point threading machine this feat is commonplace and consistent even on unusual jobs with unskilled operators.

This Stainless Steel Jet Engine locknut is just another example of CRI-DAN speed and versatility.

A 12 pitch thread ¾" long is cut in 15 seconds with scrap reduced to less than ½ of 1%.

Your Lees-Bradner representative is ready to help you "Double Production" with the CRI-DAN "B".

The LEES-BRADER COMPANY

Handle Bigger Jobs!

Precision Bearings

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djustable

Foot

on this improved

DURO

DRILL

PRESS

This new, low cost production giant is offering industry new versatility, greater capacity, added ruggedness and power. Redesigned and improved to handle those beavier jobs, it will perform a wide variety of drilling and tapping operation with greater accuracy and dependability. Check these remarkable advantages: precision ground alloy steel spindle; 4 ball bearings sealed and permanently lubricated; precision bored bearing seats assure perfect alignment; massive close grained head casting eliminates vibration; sturdy cast hinged belt and pully guard; easily adjustable feed tension with pin for positive positioning; table raising mechanism.

Specifications: ¾" capacity in cast iron; spindle has #2 Morse Taper; speed range 450 to 1965 R.P.M.; spindle travel 5"; base to spindle 44½"; table to spindle 20"; overall height 69"; 3½" column. Available without foot feed or with production type base,

Model C3088 - 18" Drill Press (Illustrated) Less Motor and Switch.

\$239.50



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Also Makers of Duro Chrome Hand Tools

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Please send me full details on your 18" Drill Press . . . plus Brochure showing complete line of power tools.

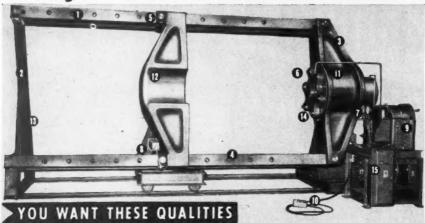
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31/2"

Quick

Table

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EASY MAINTENANCE AND SERVICING (15) Separate pump and cylinder units.

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Low in cost, easy to maintain, readily portable, these drill presses are good examples of fine engineering, rugged construction and compact design—an ideal combination that has made them exceedingly popular.

Patented spindle drive and mounting assures accuracy—and many useful attachments make possible an unusually wide variety of machining operations.

Two models: 14 inch and 17 inch.



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Sectional tables consist of center sections to be bolted tagether between end sections, forming a smooth, sturdy working surface ideal for easy movement of the work through a series of operations.

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PRODUCTION PROBLEM: To cut high unit costs of finishing brake shoes. Manufacturer found ordinary abrasive belts wore out after preparing only 50 units for bonding of linings. Frequent belt replacement kept abrasive costs at a high \$.009 per finished unit.

**RECOMMENDATION: 3M Sales Engineers** suggested that Wagner Electric Corporation (makers of Comax Brake Linings) switch to longer-lasting 3M Abrasive Belts. RESULTS: An immediate reduction in abrasive costs! Each 3M Belt finished 150 brake shoes-cut costs to only \$.003 per finished unit.

Learn how 3M Abrasive Belts can cut your costs, too. Send coupon today for full information. No obligation, of course.

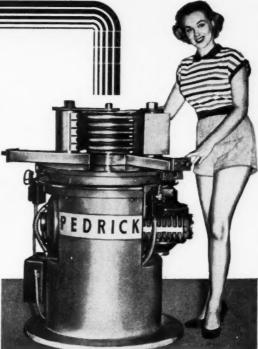
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Here is a Pedrick Production Bender producing five identical frames si-

multaneously. These savings can be yours too with a Pedrick Bender. Multiple bending is adaptable to almost all bending operations, including pipe, tube, reinforcing bars or structural shapes. Smaller and larger machines available.

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THIS IS

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- · Duplicates precision bored, drilled and tapped parts-weeks, months or years apart!
  - · No jigs needed!
  - Automatically positions to ±.0001"!
  - Production boosted as much as 250%!
  - · Doesn't require experienced operators!



THE FOSDICK MACHINE TOOL COMPANY CINCINNATI 23, OHIO

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THIS FREE BOOK

# MACHINES WORK HARDER

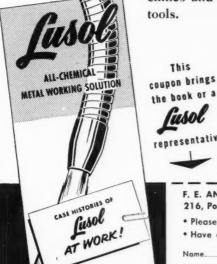
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# Why inventory hundreds when these II Standard up to 80% of your single-point



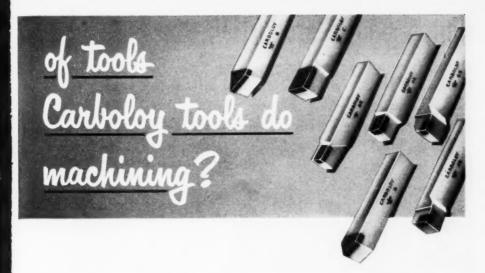
# THE Broad Versatility of Standard Carboloy Tools and Blanks Includes Machining High-temperature Alloys

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Not only do Carboloy Standards drastically cut your inventory, but actual production and cost figures compiled on an industry-wide basis in all types of shops prove beyond all question that Carboloy Tools

- . . . multiply production many times over
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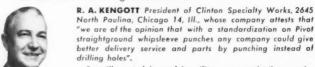
## clinton boosts production 900%





cision part was 100 pieces per hour when holes were drilled, with about 250 per drill grind.

When Pivot Straightground Whipsleeve Punches replaced drilling operations, production zipped up to a minimum of 1,000 pieces per hour . . . with an average punch life of 10-15,000 piece and occasional runs of 40,000 pieces . . . at the former cost of burring drilled holes.



Part illustrated is used in military communications equipment: stainless steel type 18-8, .045 thick, Rockwell "c" 30-35, with an .041 diameter burr-free hole.Over 1,000,000 of these were produced by Clinton to the customers satisfaction.

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#### THE COLSON STORY

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- ★ Small lots are economically practical on this new CAMLESS Automatic.
- ★ Machine operators appreciate easy access and interchangeability of tooling.
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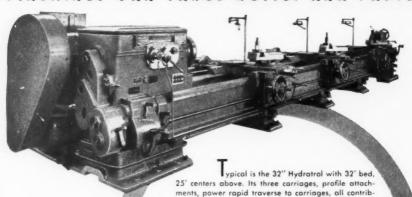
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

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Hydraulically operated speed changes.

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Automatic Slide Rule indicates spindle speeds, operation numbers, cutting speed.

Self-compensating hydraulic friction clutches and brakes.

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Dial Indica-

tor. Adapt-

tools. Read-

1/10,000th

Depth Gage. Readings to 1/1000th



When your production must be held to close tolerances there's a Tumico Dial Indicator gage that will make high speed, accurate inspections. High visibility dials give instant and accurate readings. Our complete and diversified line may provide exactly the right type of dial indicator gage to best speed and insure accurate inspections.

Let our engineers examine your product inspection problem. Write for new catalog showing additional models.

#### DIAL FOR ACCURATE

### High Frequency Checking

1" Range Dial Indicator. Attaches to many tools. Readings to 1/1000th





Lever Action Hand Thickness Gage with 1' Throat Depth. Readings to 1/1000th.

"Quality Control" of production lines can often be improved and speeded up by frequent spot checking with Tumico Dial Indicator hand and bench gages. High visibility assures quick, accurate readings to check vital production points.

Our production engineering department may be able to help you. Write us your problem. Our recommendations and complete catalog showing gages not illustrated will be sent promptly.

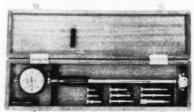
# NDICATORS

DMETER CO., Box 40, St. James, Minn.

Dial Bore Depth Gage. Range from 2" to 6" in 10" Bore Depth in 5/10,000ths.



Lever Action Hand Thickness Gage with 4" Throat Depth. Readings to 1/1000th.





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Backed right here in the U.S. by skilled technicians, factory service and quarantee, and spare parts readily available from every Hirschmann Branch.

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#### FLUTE DEVELOPMENT GIVES YOU

- \* Deep counterboring with a wider range of pilot sizes.
- A higher helix angle which assures faster chip disposal.
- New tooth construction thus providing maximum heat dissipation.

#### The DIFFERENCE at a glance!



End view of counterbore showing conventional flute form, designed for spot facing and shallow counterboring.



New style flute form designed for spot facing and deep counterboring; chips can flow freely from pilot diameter.



Side view of counterbore showing conventional flute design which provides ample thip clearance for shallow counterboring and spot facing.



New style flute form with increased helix angle permitting faster chip removal, thus reducing heat to a minimum in deep counterboring.

Our present stock is being replaced with the new design as rapidly as possible so that in the very near future all orders will be filled with this later design within the range of sizes provided.

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# Grind Cutters of ALL Types... --- Quickly and Easily with the

#### OLIVER ACE

Universal Tool and Cutter Grinder

Excels

on High Speed and Tungsten-Carbide Work Faster on Most Grinding Operations

# Simple Set Up Easy Operation

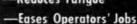
Requires No Computation . . . Handles Wide Range of Cutter Grinding

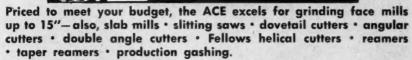
Built to give long-lasting service, the soundly engineered Oliver Ace Universal Tool and Cutter Grinder will easily keep your most difficult cutters sharp. Equip your Toolroom NOW with an Oliver Ace . . . so efficient . . . so economical to operate.

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2 MODELS: Standard and Heavy Duty (illustrated)
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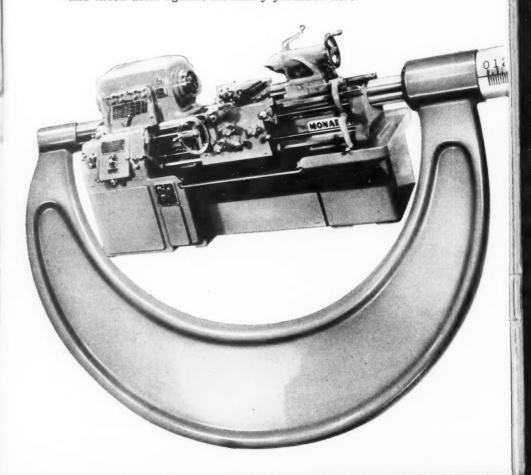
MACHINE TOOLS by OLIVER include:

AUTOMATIC DRILL GRINDERS TOOL & CUITER GRINDERS DRILL POINT THINNERS TEMPLATE TOOL GRINDERS FACE MILL GRINDERS DIE MAKING MACHINES

# Check Lathes Like You ... and it's Monarch

✓ You have your mikes and blocks and gauges for checking lathe production. But what kind of test is there for the lathe itself? How can you gauge its performance before you buy—at the time when you're establishing the standards for the quality and costs of your entire operation?

This way! Lathe performance is only a reflection of the quality built into a lathe—of its features of design and construction. So check features—and check them against the handy yardstick here.



## Check Their Output Series 60 Every Time

✓ Check, too, the strength, weight and power built into each machine. You not only find every desirable construction feature in the Monarch Series 60—you'll find that almost every one of them was originated by Monarch. Doesn't that make the Monarch Series 60—Toolmaker's and Engine Lathes, both—the standard that you're looking for? Write for Bulletin 1113, and see for yourself . . . The Monarch Machine Tool Company, Sidney, Ohio.



All Series 60 Toolmaker's and Engine Lathes are available in 13", 16" and 20" swings — each in various lengths. Most can be equipped with any one of three Monarch Tracer Controls.

#### LATHE FEATURE CHECK-LIST

	MONARCH	LATHE		MONARCH	LATHE
Totally enclosed gearbo and end gearing—for sus tained accuracy.		?	5 American Standard Cam- lock Spindle Nose—for quick, rigid chuck and fix-	Yes	?
2 Automatic pressure lubrication — for long life a original efficiency.		?	ture mounting.  6 Flame-Hardened and Precision-Ground Integral	Yes	?
3 All anti-friction bearings- for peak power and re- duced maintenance.		?	Bedways—for sustained accuracy throughout the life of all four ways.		
4 Hardened, ground of shaved, wide helical gear in headstock—for precision power, easier shifting.	s	?	7 All critical parts made of hardened alloy steel — for long, trouble-free life.	Yes	?



# **UNCLE!**

Are your machines begging for mercy because of misuse?

Blanchard Grinders, with proper grinding wheels, can and do give high production with extremely close tolerances for dimension and flatness. However, a No. 11 Blanchard user recently received erroneous advice on abrasive wheels from an outside source. The result was that 35 high-speed cam plates were ground on both sides in 1½ hours with surface finish of 24 micro-inches.

By referring the problem to Blanchard, it was easily demonstrated that the No. 11, with correct grinding wheel, would give desired results—90 to 100 cam plates per hour, with surface finish of 4 micro-inches, dimension tolerance of  $\pm$  .0002, and flat within 2 light bands.

Blanchard wheels are best for Blanchard Grinders—let Blanchard give you the benefit of their vast experience so that you too can get the most from your Blanchard machines. "PLEASE CONSULT THE
ENGINEERS WHO DESIGNED ME,
AND LET THEM SPECIFY THE
CORRECT BLANCHARD WHEELS,
SO THAT I CAN WORK FOR YOU
BETTER, FASTER, AND CHEAPER

Information on correct surface grinding procedure and wheel selection are given in "Work Done on the Blanchard" and "The Art of Surface Grinding."Write for free copies today!





THE BLANCHARD MACHINE COMPANY

PUT IT ON THE BLANCHARD

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.





- . 90° Universal Milling Head
- 2. Hi-Speed Milling and Drilling Head
- 3. Deep-Hole Internal Grinder Head
- 4. Basic Milling Unit
- 5. Milling and Grinding Table
- 6. Universal Feed Table
- 7. Internal Grinder Head
- 8. External Grinder Head
- 9. Slotting and Keyseating Head
- 10. Geared Dividing Head





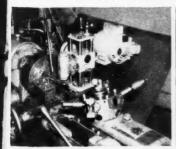
MODEL "C," ½ hp — 9" TO 13" LATHES MODEL "B," ½ OR ¾ hp — 13" TO 18" LATHES MODEL "M," 1 OR 1½ hp — 18" TO 72" LATHES



The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, internal and external. Its full complement of equipment is an outstanding value for maintenance, repair, tool room, and

experimental shops, as well as production, thus performs a full range of shop operations at a minimum investment. These improved models are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our 17 years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

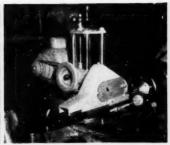
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End Milling 21/2" keyway in 97/2" diameter shaft 22 ft. long



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Powerful and ruggedly built, flexible and easily operated, Stone High Speed Cut-Off machines are ready to give you all the advantages of fast, clean, low-cost abrasive cutting. The geared-in-head motor on each model is engineered without the use of belts, an exclusive Stone feature permitting delivery of maximum constant power.



#### MODEL M14

32" x 34" Bench Model. This mighty little brute, with full 31/2 h.p. gearedin-head motor engineered with positive drive, will cut all ferrous and non-ferrous solids up to 2" - pipe and structurals up to 21/2". Two models - straight cut-off and swivel head for angle cutting to 45°. Legs available.



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MODEL SS20

Operates on guided rails for cutting larger structural steel, plate, sheet, with cuts up to 10 feet in length. Cuts wet or dry.

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NE MACHINERY CO., INC.

Fayette St. Manlius, N.Y.





All Lovejoy Blades for Type A"Milling Cutters are interchangeable from 4½" to 24" in diameter

. . . and this applies to every "A" cutter ever made!







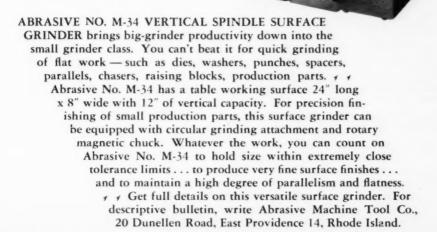
Lovejoy Type "A" face milling cutter blades offer unsurpassed economy - 1) they are interchangeable throughout the complete range of housing sizes, 2) H.S.S., carbide and cast alloy blades are interchangeable in every housing, 3) every blade will fit every Type "A", even if you have housings 30 years old, 4) only a minimum of stock must be removed when sharpening, 5) a large percentage of every blade is usable; 6) there is no need to carry a large inventory, as Lovejoy can supply blades promptly from stock. For superior performance, plus maximum economy, use Lovejoy Type "A" for every face milling job.

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Drill Presses

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For jobs where neither the capacity nor expense of a heavy industrial machine is warranted, and where a "hobby drill" would be wholly inadequate, Walker-Turner has engineered a special class of Light-heavyweight Drill Presses.

Professional in design and operation, yet light for production machines, this "in-between" line gives industry the needed capacity for short-run production work, without the necessity of heavy investment. Walker-Turner makes 15" and 20" Drill Presses (in Bench, Floor, and Production Models), as well as Radial Drills. For complete information, use margin below to write your name and address.

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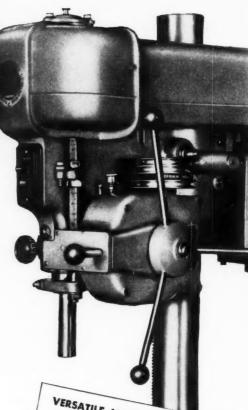
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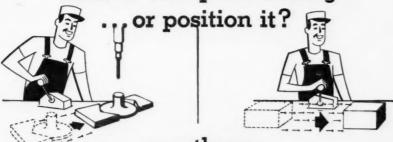


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Designed for industrial users where production rate and initial cost are primary factors in the selection of equipment, Walker-Turner 20" Drill Presses operation of equipment, Auliple State any rate of peed from 400 to 2600 r.p.m. Auliple State of State o



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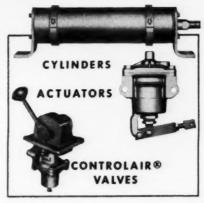
use these

low cost pneumatic muscles

It's hard to find a machine that doesn't require powerful, linear motion in some part of its operation. Clutches must be engaged, objects must be grasped and held fast, heavy loads have to be moved in a straight line.

Air is the answer. Pneumatic cylinders exert powerful, cushioned force for any holding operation. Pneumatic actuators allow hair-splitting accuracy if you want to position something exactly. In addition, you have your choice between a very wide range of air controls that permit the most complex interconnected assemblies.

But the best part is this: you can buy everything, the cylinders, actuators, control valves and the compressors from one company, Westinghouse Air Brake Company, world leader in engineered pneumatic control systems.



There's a Westinghouse Air Brake Company distributor near you; just look in your Classified Directory under "Air Compressors." He'll be glad to show you how Westinghouse components can improve your product.

INDUSTRIAL PRODUCTS DIVISION

**X/ESTINGHOUSE** 

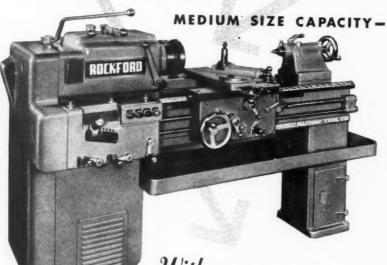
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Usually only in larger, more costly machines do you find the combination of speeds, swing, power, feeds and threads that are standard equipment on Rockford Economy Lathes. These features make it possible to machine a wider range of work with fewer non-productive hours than is possible with many machines in its class.

Medium-sized and economy-priced, it's built to handle any job that can be turned or threaded within 16-1, 2" or 18-1, 2" swing, and 30" to 102" center distance. 3100 lbs. of weight, 6" bed and zero precision bearings furnish the rigidity and precision for turning out tool room accuracy.

Ask a Rockford Machine Tool Co. representative to give you full details on these machines, or write direct for our new bulletin No. 900A.

MEDIUM-SIZED

ROCKFORD ECONOMY LATHES-16" and 18"

ECONOMY-PRICED

ROCKFORD MACHINE TOOL CO. 2500 Kishwaukee Street, Rockford, Illinois



#### Cut Their Finishing Time As Much As 50%

SAVE on finishing products, parts, assemblies, in all metals, plastics, wood, glass, hard rubber, pressed and laminated materials and combinations.

Save by combining burring, finishing, cleaning, polishing, into one time-saving operation with rubber-cushioned Brightboy. Get the working advantages of both abrasive and rubber in Brightboy's unique, smooth-surfacing action. Achieve finishing versatility and adaptability beyond the range of conventional abrasives—in less time—in fewer operations.

#### GENERAL USES-A FEW OF MANY:

Remove light digs, tool and heat marks. Clean welded and soldered joints. Finish dies and molds. Burr stampings, castings, machined parts. Maintain tools, equipment, machinery, parts.

#### HOW BRIGHTBOY SAVES PRODUCTION TIME

Use it for countless jobs regular abrasives cannot do—PLUS low cost, "every-day" finishing. Bridge the gap between the rough grind and the buff in one operation! Work to close tolerances. Shape to contour. Obtain a wide variety of conventional and special finishes and patterns—damaskeening, for

example; often the "final' polish. No before-use preparation or dressing needed. No skilled labor necessary.

#### TRY A TEST!

Ask your dealer for this free sample card containing Brighthoy blocks in 3 textures, and for the Brighthoy catalog-manual. Write us if be cannot supply you—or on any problem where finishing is involved.





WHEELS, STICKS, RODS, BLOCKS in three textures for machine and manual operations

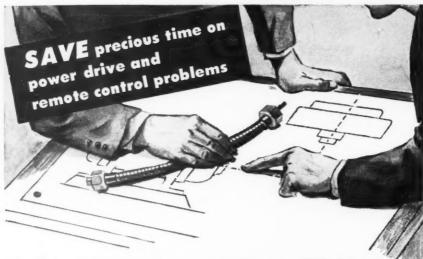
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December, 1952

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# HOLE PUNCHING AND NOTCHING EQUIPMENT the most complete line **WALES**



Showing a setup of Wales independent, self-contained Hole Punching and Notching Units with the finished flat sheer in the foreground. Note, nothing is attached to press ram.

A Only creative ability can produce an original and complete line of new parented products. That, basically, is what has made Wales Equipment the leader in tooling for hole punching and nocching.

Many metal fabricators have made it standard practice to call in Wales



Wales Fabricator provides rapid interchangeability for punching and norching. Work from blueprints or operation sheets. No templets required.



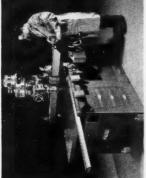
Showing a setup of Wales Horizontal Type Units for purpling by a purpling holes in curved and straight flanges and rims with the curved flanged work nested in position are acidy to be purplied acoust in the entire rim. Note, these units are mounted on templates.



Showing two progressive, self-contained Wales Boxtype Assemblies. With Wales Hole Punching Units, any good mechanic can make a hole punching die for press brakes or stamping presses.

Service Engineers whenever tooling is being planned for hole punching and notching in angles, channels, extrusions and sheets. These fabricators have found it is more economical and time saving to call on Wales before designing and building special hole punching and notching dies because STANDARD wales Units can be used at greater savings.

Take advantage of the years of Wales research, engineering and "know how" by writing TODAY for fully-illustrated, functionally colored catalogs of this complete line of Wales Equipment.



Wales Drilling Machine with Boring Head is specially designed on meet the exacting requirements of locating, drilling, reaming and boring holes in material of practically any length and up to 36"



Showing a setup of Wales Type "HS" Hole Punching Linis for punching mild seel up to 3.4'f thick. This high capacity unit is typical of the versatility and wide targe of uses of Wales Hole Punching and Notching Equipment.

# WALES-STRIPPIT CORPORATION

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398 Payne Avenue, North Tonawanda, N. Y. (Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment



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Ruggedly built for "tough" industrial applications, LIMA MOTORS are piling up records of outstanding dependability in progressive industrial plants throughout the world.

Original equipment manufacturers, quick to observe the performance of these motors, are specifying LIMA for their products.

Prompt deliveries on ratings of 1/3 to 150 HP, with Dripproof or Totally Enclosed frame construction.

Photo below shows a LIMA Dripproof Motor, direct-coupled to a BARNES L Type Hydraulic Unit—an original equipment application.





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# COST REDUCTION

thru faster, continuous broaching



• Wherever metal is removed on duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut manufacturing costs. Production is high, and tool maintenance is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

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# FOOTBURT

machine tools

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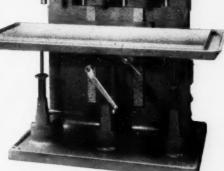
You'll be convinced beyond doubt it is the machine you need for uninterrupted performance and increased production with a wider margin of profit.

Our first-time customers become Aveyminded because the Avey High-Speed, Sensitive and Upright Drilling and Tapping Machines do the job faster . . setting new records for cost cutting and mass production with minimum of maintenance.

You'll be proud to own an Avey Four-Spindle No. 2-BMA-6 Combination Machine . . . it is engineered and time-tested to give you the most for your dollar.

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Four-Spindle No. 2-8MA-6 Combi Machine, Built in No. 2 and No. 3 sizes.

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THE COEL DRILLING MACHINE CO.

Cincinnati 1, Ohio

# Entirely new approach to grinding process by world's leader in machine tools led to

**CINCINNATI** Grinding Wheels

Cincinnati Grinding Wheels stem from a frank recognition of this basic fact:

The grinding wheel is a true cutting tool.

Yearing practitude that cutting abra piece fication other.

Performance of experimental wheel is checked by member of research staff on one of several grinders in Cincinnati Grinding Wheels laboratory.

Years of research in The Cincinnati Milling Machine Co. laboratories, coupled with practical experience, proved beyond doubt, that the grinding process is a true metal cutting process. The grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.



Ground surface of SAE 3145 steel showing partially formed chip (A) and groove (B) in workpiece from which material of chip was removed. Entire length of this chip is park about 0.002"

BASIC CHIP TYPES







This new concept is the beginning of an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function-as true cutting tools producing true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. These men can serve you well.

For a demonstration in your own shop on your own machines of how to get the most out of Cincinnati Grinding Wheels, just write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.

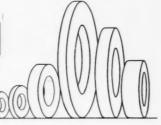


Cincinnati Grinding Wheels are manufactured in this new, completely modern plant.

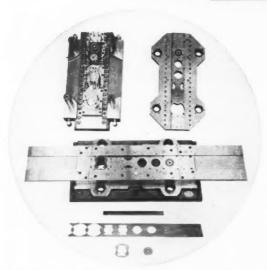
FREE BOOKLET. Now available to industry is a brand new booklet entitled "A New Concept In Grinding Wheels." It's packed with important information for anyone interested in grinding operations. A copy is yours for the asking, Just write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



Cincinnati 9, Ohio



# This die was not just "made"... it was ENGINEERED



Just a choice of words, you say? No, it's more than that. The progressive steel lamination die shown here was hole-bored, hole-ground and contour-ground to pre-engineered dimensions entirely on Moore-built machines in the Moore toolroom. It exemplifies the application of engineering principles that put dismaking on an interchangeable parts-and-assembly basis for the first time.

Let's take a close look at this die: All die sections are mounted in a hardened nickel-chrome frame for maximum production and die life; the die set was specially made by Moore. The spring stripper is guided on four main posts. High-speed inserts are set into hardened steel frames.

Moore produced all parts of the die to figures instead of to "fit." This was done concurrently by several toolmakers instead of progressively as a slow, one-man job.

#### Precision Hole Location and Contour Grinding Methods Assure Accuracy, Speed, Economy

THE NO. 2 MOORE JIG BORER bored all holes before hardening, thus holding the location as close as possible to eliminate

excessive grinding. With its built-in system of accurate lead screws, the Moore Jig Borer can spot, drill, bore or ream all holes in a workpiece with minimum tool changes and to close tolerances.

Punches and dies of the first station—at the right in the photograph—were ground with a Moore Panto-Crash Wheel Dresser. This machine, which combines roll-crushing and diamond dressing, did the required linear contour grinding quickly and effi-



No. 2 MOORE JIG BORER

ciently. Moore Motorized Centers handled several of the smaller grinding jobs.

WITH THE NO. 2 MOORE JIG GRINDER, all die sections were screwed and doweled into place, put on the machine and ground in one set-up. This eliminated separate section hole-grinding and the accompanying difficulty of

accurately locating each section in the die bed. The Jig Grinder does the job in onethird the time required by previous methods.

To grind Stations 2, 3, 4, 5 and 6, the new contour-grinding and slot-grinding features of the Jig Grinder were utilized.

Die try-out and assembly operations were performed the modern, fast, "mechanized" way on the *Moore Die Flipper*.

End results? Moore equipment brings true interchangeability to the toolroom, lowers tool costs, increases toolroom capacity, prolongs die life and achieves greater accuracy.

Detailed bulletins on these machines are yours for the asking-today. Write to: Moore Special Tool Company, Inc., 730 Union Avenue, Bridgeport 7, Conn.

#### ADD COND TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO CRUSH WHEEL DRESSERS
DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

# Capillarity test proves ALUNDUM\*Abrasive makes polishing wheels last longer and perform better

Capillarity, the ability to absorb liquid, is one property of abrasives which largely determines a polishing wheel's strength and resistance to breakdown. When abrasive grain has high capillarity it is held more firmly by the glue on the wheel head — sticks on the wheel until all its work is done.

Norton ALUNDUM abrasive is specially treated to raise its capillarity and to retain this valuable quality assuring longer lasting, more efficient polishing wheels.

Offering many other advantages for fast, clean polishing, ALUNDUM abrasive grain is available in sizes and with surface treatments for best results on every polishing job. Write for Booklet No. 1340, "Setting Up Polishing Wheels And Belts," containing many helpful tips. Norton Company, Worcester 6, Mass. Distributors in all principal cities.



\*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

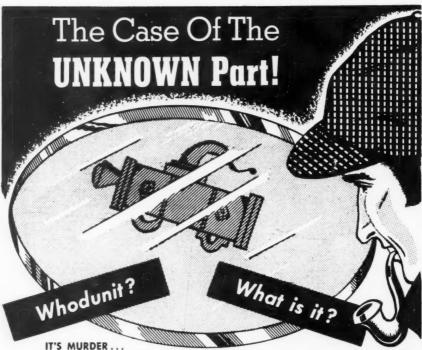


LOW CAPILLARITY is shown by the way this abrasive grain sheds water. It will repel give in the same degree, resulting in insecure adhesion of abrasive to wheel head — and short wheel life.



NIGH CAPILLARITY of Norton ALUNDUM abrasive grain soaks up every drop of water. It will soak up glue in the same way, assuring a stronger, longer lasting, faster cutting polishing wheel.





... for your customers to try to reorder metal parts which aren't properly marked.

And it blackjacks your production, too, when your components can't be identified instantly.

#### SOLVE THE MYSTERY-

Mark 'Em for Profit . . .

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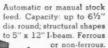


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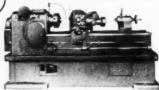
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## over the editor's desk

#### A Great Opportunity

WHEN the results of last month's national election became known, Mr. R. Kennedy Hanson, the able general manager of the American Supply & Machinery Manufacturers' Association, Inc., sent a letter to the members of his organization, the contents of which we feel are of vital importance to those engaged in the manufacturing industries. We are taking the liberty of reproducing Mr. Kennedy's letter herewith.

"The die has been cast. The people of the United States of America have spoken. They have spoken clearly. They have done so in large numbers and from all walks of life.

"This election has not only shaken the entire nation, but the world. Undoubtedly you have heard on the radio or seen on television, or read the appeal made by the losing candidate to Mr. Eisenhower and also Mr. Eisenhower's reply, which in brief calls for unity of action and a united America having prosperity with peace.

"May we pause a moment to survey the results of this election, as far as our own respective businesses are concerned and particularly its effects on labor. Many men in your plants at the present time are very unhappy about the results of the election. It may be that many of them are already expecting that some of labor's gains in the past 20 years will be lost and now management is apt to 'give them the works.'

"The worst thing to happen would be to have such a wave of thinking pass through the Unions, and their employees. Management now has an unusual opportunity to give to their men the assurance that the changes in Washington, as of January 20, will not affect their workers as far as a friendly and cooperative attitude is concerned, and that you will be happy, at all times, to listen to both sides of a problem.

"This election and its results afford you an unusual opportunity to increase your friendly relations with your employees. It is about time that we won back the respect and the friendship of our employees and we should also be able to encourage labor unions to get back to more sound thinking and planning for the future. We can do it if we but try."

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# Machine Shop

Vol. 25, No. 7 DECEMBER, 1952 features in this issue

#### **Building the New Atomic Cannon**

By W. H. Collins

A report on some of the operations involved in the machining of various major assemblies for the Army's new atomic projectile weapon. Of particular interest is the unique method employed in the machining of the cradle tube assembly. Page 114.

#### Supporting Elements for Jigs and Fixtures

By Fred Rogers

In this article, the author describes in detail more than twenty different designs of supporting elements. Everyone concerned with the construction of jigs and fixtures will find the material presented here of particular help. Page 120.

#### Boring Mill Characteristics and Work, Part III

By John E. Hyler

This article of the series covers horizontal boring mills, including their design features, available types of construction, jig boring facilities, and different styles of tables. Page 130.

#### **Magnetic Particle Weld Inspection**

By Gilbert C. Close

An explanation of the principles involved in the process and how these principles may be utilized to detect defects in ordinary fusion welds in ferrous materials. Page 150.

#### "Hydro-Sizing" Proves Economical

By Everett Jackman

The author describes a pneumatic method of accurately finish-forming externally-carried fuel tanks which has enabled a large aircraft manufacturer to reduce floor-to-floor time from 50 minutes per tank to 5 minutes. Page 170.

#### Pension Plans in the Machine Shop

By Robley D. Stevens

The author offers a number of practical suggestions which should prove helpful to anyone who is considering the adoption of a pension plan for the employees in his shop. Page 180.

#### The Push Button Era Has Reached Gaging

By C. W. Kennedy

An explanation devoted to the operation and the advantages of automatic gages in the checking of workpieces. Page 198.

## Building the new Atomic Cannon

By W. H. COLLINS

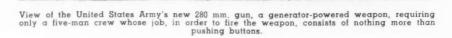
New atomic projectile gun result of Army, science, and industry teamwork.

A new all-purpose gun, capable of firing an atomic projectile with precision accuracy in all kinds of weather opens up new vistas in the capabilities of the American Army to discharge its primary responsibilities in the field of land combat. This new artillery piece provides ground commanders with fire support of great

range, flexibility, and volume which can be delivered with extreme accuracy and reliability at any time of the day or night regardless of zero ceilings, storm, hail or other conditions. Although five contractors had major parts in producing this first atomic artillery piece, and six Army Ordnance installations were directly concerned in the development and production of the 280 mm. gun and its associated equipment, credit for the actual fabrication along "assembly line" procedures must be given to Dravo Corporation of Pittsburgh.

A prototype of the new gun was made piece by piece at Watertown Arsenal, Watertown, Massachusetts. During its construction, engineers worked to solve the problems of stresses, weights and a myriad of other factors.

Although Dravo Corporation received its first order for an undisclosed number of the gun carriages by letter



from the Pittsburgh Ordnance District in February, 1951, some 2,200 necessary drawings were not completed and ready for use until mid-summer.

From the time the formal contract was awarded to Dravo on September 27, 1951, until the first unit was shipped to Aberdeen from Pittsburgh, only 10 months had elapsed. Processing of hundreds of extra blueprints and shop orders for welding, machine operations and assembly; analyzing each assem-

bottom of the girders. Steel castings are welded inside for bearings and gears. In order to assemble the top carriage it was necessary first to fabricate sub-assemblies of component parts. Maximum tolerances allowed for the sub-assemblies of the top carriage are 1/32 of an inch.

The side girders of the carriage were built in special jigs. Transverse members were installed to join them. In the final welding stages of this assembly,



A view of the Army's newest weapon mounted on a specially designed vehicle in position for being transported to site of firing.

bly and sub-assembly for operational sequences, and setting up a materials procurement program were a few of the production problems. Working with Ordnance personnel, other manufacturers and suppliers of tons of basic metals, castings and forgings, Dravo Corporation began to receive materials by Fall.

In late November, fitting and welding jigs, dies and gages had been completed and fabrication of steel plate was started in Dravo's Structural and Sheet Metal Shops. On July 18, the first carriage left Pittsburgh by rail.

The largest weldment in the assembly is the top carriage, 38½ feet long. It is made up of two double-web girders joined by transverse steel frames. Stainless steel flanges are fixed to the

the carriage was rotated eleven different times to permit welding according to a procedure designed to lessen distortion. All steel castings in the top carriage were pre-heated before being welded. After welding, the top carriage was sandblasted, given an acid bath and painted.

The first machining operation on the carriage was performed on the stainless steel slides. A special fixture was designed and built to support the carriage on a 26-foot planer. One-half the slides were machined at a time; then the fixture with the carriage on it was rotated and the other half completed. A large boring mill was employed in the cutting of the holes in the carriage for gear shafts and other parts.

The cradle tube assembly which is

supported on the carriage with trunnions is a heavy alloy steel casting, with stiffeners and trunnions of the same material. It was pre-heated to and maintained at 700 deg. F. for welding operations. Critical operation on the cradle was alignment of the two

its movement sideways. To cut on the specified radius, a steel segment was supported on a pedestal bolted to the floor several feet away from the planer. The other end of the segment was attached to the planer table. Movement of the planer table drew the piece

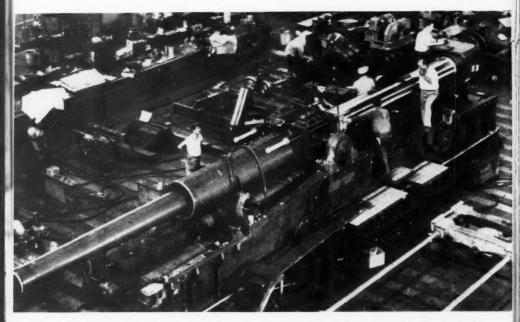


Illustration showing the carriage of the new 280 mm. gun that can fire an atomic shell in the final stages of production on an assembly line at Dravo Corporation's Pittsburgh plant.

trunnions with a keyway that receives the gun barrel's key. The keyway is three inches wide and eight feet long. To cut this slot within the tube, a fixture was developed to support the entire assembly on a planer. Using sets of progressively wider cutting tools, attached to a bar connected to the planer head, the keyway was cut.

Another special fixture was used for machining a rack slide which is located on the rear of the carriage to guide along the stationary cutting head and provided the necessary arc.

Weight of the gun carriage is a vital factor due to the necessity of transporting the weapon over bridges, culverts and terrain which might not be sufficiently strong or stable to support it. At the same time, the carriage and its equipment is fabricated to resist the force of discharge recoil and stresses of being transported. Ordnance designers specified the use of many types



This view shows the retraction stop pads of the carriage being machined on a 26-foot planer.

of high tensile, carbon, alloy and stainless steels, plus lightweight aluminum and magnesium, and bronze and brass for the structural parts, castings, forgings and fittings. Wherever a pound could be saved without sacrificing strength, it was done.

Welding plays a major role in fab-

ricating the carriage. To assure stronger, smoother welds, most of it is done in the downhand position. A total of approximately 8,200 feet of welding was required in building one assembly and its component parts. Every weld was inspected, before and after the pieces were stress-relieved, with a

View showing how the gear housings in the carriage are being bored on a Giddings & Lewis boring mill.



Magnaflux machine or by the dye pentration process.

Development of the special jigs and fixtures by Dravo enabled faster production of the carriage on an assembly-line basis and assured that the work would be completed within the critical specifications and tolerances. These production aids also permitted the use of available machine tools without delaying manufacturing for several months to build special equipment.

Close liaison is maintained constantly with personnel of Watertown Arsenal and the Pittsburgh Ordnance District in problems of material procurement, specifications, and all other phases of the project. Resident Ordnance Inspectors at the Dravo plant provide technical assistance and cooperate in the painstaking, intricate work.

The prime contractors who had major parts in producing this first atomic artillery piece besides Dravo Corporation were; R. Hoe and Company of New York; Kenworth Motor Truck Corporation of Seattle; Baldwin-Lima-Hamilton Corporation of Eddystone, Pa.; and the Treadwell Construction Company of Midland, Pa. The six Army Ordnance installations concerned with the development were Watertown Arsenal, Watervliet Arsenal, Frankford Arsenal, Detroit Arsenal, Picatinny Arsenal, and Aberdeen Proving Ground.

Metallizing Application Film

A 16-mm. 28-minute sound film in full color, recently completed by Metallizing Engineering Co., Inc., Long Island City, N. Y., describes the met-

A view of the cradle tube assembly being machined on an engine lathe which was converted for preliminary boring. A Mack truck transmission in conjunction with a specially designed boring bar is used to make recesses for bearings and other preliminary work on the cradle tube.

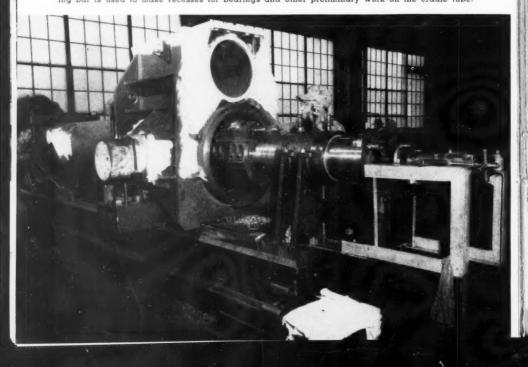




Illustration showing the cradle for the barrel being assembled to the carriage.

allizing process and shows a wide range of practical applications as reported by many users throughout industry. Every scene in the film was taken in the plant of a metallizing user, showing maintenance departments metallizing worn or damaged machine parts. The film also pictures how thin coatings of comparatively expensive metals on ordinary base metals provide desired service characteristics at minimum costs. The latest methods of surface preparation are demonstrated, as well as the use of metallized aluminum and zinc for the protection of iron and steel equipment and structures against corrosion, such as storage tanks, bridges and trestles, degreasers, and other steel work.

Suitable for presentation to industrial, professional, and educational

groups, the film is intended to promote a broader understanding of metallizing, to explain the principles on which it operates, and demonstrate its practical uses and applications throughout industry. Further information regarding the film may be obtained by writing to Mr. R. J. McWaters, Metallizing Engineering Co., Inc., 38-17 30th St., Long Island City 1, New York.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

# Supporting Elements for Jigs and Fixtures.

By FRED ROGERS

## In which the author describes and illustrates a variety of currently used designs and methods.

UCH has been written and illustrated on the subject of drilling jigs and milling fixtures regarding holding and clamping mechanisms, slip and fixed bushings, main bodies, location jacks and pins, and so on, both in magazine articles and text books. However, supporting elements, commonly referred to as legs, feet, pins, pads, buttons and rests have been touched on only briefly. This article proposes to discuss these latter named parts and to show pictorially the various designs and methods currently used.

While some years ago, and in fact at the present time also, jig and fixture bodies were cast, it is now common practice to save both pattern time and expense and to fabricate practically the whole unit by welding, especially where size is a factor. The duty imposed upon the jig or fixture for the most part, dictates the use of either soft or hardened surfaces. This would include either cast or malleable iron, heat treated or non-heat treated steel or some other non-wearing and abra-



Fig. 1 — Drawing of threaded support having hole for assembling with pin wrench.

sion resistant material. In any event, bearing surfaces are usually ground either before or after assembling unit. When shoulder-ground pins or combination pin and screw are to be pressed into previously ground plates or bodies, there is usually sufficient accuracy

a further grinding operation is necessary. If, however, the jig is built up by welding various pieces together, the bearing surfaces of the supports are touched off by

maintained that



Fig. 2—A press type support having two milled flats on lower portion of body to facilitate replacement.

surface grinding after assembling.

The first part of this article will deal with the inserted parts, either through press fit or by threading. The second part will show integrally cast supports and those attached by welding or by brazing.

The screw type shown in Fig. 1 is threaded to a relief under the head. The bearing end is chamfered and only this part is case carburized and hardened. The thread shoulder end is ground. After the supports are assembled the bearing surfaces are surface ground simultaneously. The supports are assembled with a pin wrench for which the hole is provided. Threaded

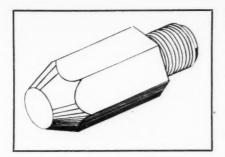


Fig. 3—Drawing of support made of standard hexagonal stock.

supports are usually made with a snug fit on the thread to that no looseness is present; thus, better alignment results. The case carburizing operation must be deep enough for at least  $\frac{1}{16}$  in. penetration so that the grinding operation after assembling does not remove the hardened portion from the bearing surfaces. Actually, only enough material need be ground off to assure proper bearing all around.

The press type support shown in Fig. 2 has two flats milled on the lower portion of the body to facilitate replacement if necessary. Means of removal must be provided particularly when such a support is pressed into a blind hole. To be wrenched free, the stem is ground to just a snug fit otherwise it might be too tight for disassembling. This type of support is hardened and ground all over.

Hexagonal stock is often used for supports with the stem end threaded as shown in Fig. 3. The rest end is chamfered conically to a 60 deg. included angle. Ordinarily, the head of a hexagon head cap screw is chamfered 30 deg. on a side which in some instances is sufficient. Indeed, hex head cap screws have been used as supporting elements when the height of the

head is sufficient as a rest. Regular commercial hex stock of low carbon content may be used. A carburizing case is provided deep enough to withstand the grinding true-up of the bearing surface. In the ordinary heat treated hex head cap screw, the hardened surface is usually only skin deep and therefore cannot be ground off unless a hardened surface is not required.

Morton Machine Works of Ferndale, Michigan, manufacture Standard rest buttons for use as jig feet. See Figs. 4

and 5. They are made of alloy steel, hardened and ground. The stem diameter which enters the jig body and the height of the head are held to plus 0.0005 in.-minus 0.0000 in. Eight sizes are available ranging from % in. stem



Fig. 4 — Drawing of commercially available rest button designed for use as a jig support.

dia. by  $\frac{1}{16}$  in. long with head  $\frac{1}{16}$  in. dia. by  $\frac{7}{16}$  high to 1 in. stem dia.,  $1\frac{1}{4}$  in. long with head  $1\frac{5}{8}$  in. dia. by  $\frac{3}{4}$  in. high. The stems are ground 0.0005 in. oversize for press fit. Stems are ground

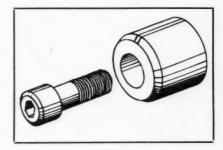


Fig. 5—Drawing of a button type jig support designed for attachment by means of socket head screws.



Fig. 6—Drawing of jig support having ground stem designed for press support in reamed hole.

with a slight lead at the end for ease of assembling. The ends of the stem and head are chamfered. The shoulder is necked or relieved and ground for accurate seating. They are black-finished.

For smaller jigs, eight other sizes are available, three having  $\frac{1}{4}$  in. diameter stems with  $\frac{1}{2}$  in. dia. heads, the head height being  $\frac{1}{4}$  in,  $\frac{3}{8}$  in. and  $\frac{1}{2}$  inch. The other five have  $\frac{3}{8}$  in. dia. stems with  $\frac{5}{8}$  in. dia. heads and head heights of  $\frac{1}{4}$  in.,  $\frac{3}{8}$  in.,  $\frac{1}{2}$  in.,  $\frac{5}{8}$  in. and  $\frac{3}{4}$  inch. These are made of machine steel hardened and ground on both stem and head shoulder and ends. The same tolerances as mentioned above are maintained.

Button jig feet, as shown in Fig. 5, are available for attachment by means of socket head screws. These buttons are counterbored for the screw head so that the top of the head is recessed

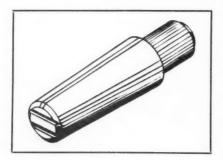


Fig. 7—Drawing of tapered type jig support having ground stem.

1/32 in. below the bearing surface of the button. They are made of machine steel, hardened and with both ends ground and one end chamfered. There are  $12 \text{ sizes} - \frac{5}{8} \text{ in.}$ ,  $\frac{7}{8} \text{ in.}$  and  $1\frac{9}{8} \text{ in.}$  O.D. and in height of from  $\frac{1}{4}$  in. to 1 in., advancing by  $\frac{1}{8}$  inch. The shortest one is held by a 10-32 flat head machine screw while the rest are held with 10-32,  $\frac{1}{16}$  in. and  $\frac{1}{2}$  in. socket

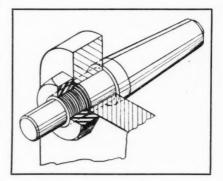


Fig. 8—Drawing of support with double-ended design for use when jig must be turned upside down.

head cap screws which are supplied with the buttons.

Several years ago the patented and purchasable jig supports shown in Fig. 6 and 7, were placed on the market by Rolyan Metal Products of Chicago, Illinois. This type is unique in two respects. Whereas other types of supporting elements have ground stems which fit into reamed holes, this type has stems that are straight-knurled. This knurled portion is pressed into a drilled hole rather than a reamed hole, thereby saving a reaming operation for each hole involved. The second feature is that the bearing or rest-ends are grooved for chip clearance. These legs are heat treated and ground. The

longer one shown in Fig. 7 is tapered for its extended length and chamfered at the bearing end. A range of sizes and lengths are available.

The support shown in Fig. 8 is of double-ended design so that the jig can be turned up side down. The long end is tapered below the base of the jig. It has a push fit thru the base and is held to the base by means of a hex nut. The other end is turned to a diameter just below the root of the thread. Made of mild steel, the ends are cyanided. In this instance, the various lengths are

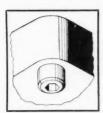


Fig. 9 — Drawing showing application of standard socket head cap screw as support for jig or fix-

held to close tolerances for the set of four supports so that grinding the end bearing surfaces after assembly is not necessary. The chamfered diameters of the bearing surfaces are the same at both ends.

Parts at hand are sometimes used for jig and fixture supports where it is felt that specially made parts would interfere with production or increase the cost. Reference is made to commercially available socket head cap screws, steel pipe plugs and hardened taper and straight dowel pins. Two-diameter pins are thereby eliminated. These parts, after assembling are merely touched off by a surface grinding operation, so that the jig is level and square. Several methods using these parts are illustrated.

The head of a socket head cap screw as illustrated in Fig. 9, may be used for jig and fixture support. Made of alloy steel and toughened by heat

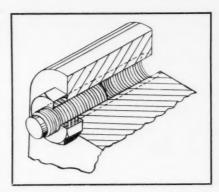


Fig. 10—Drawing showing use of dog point screw with hex jam nut as jig support.

treating, they resist wear. There is no possibility of cracking because they do not have high hardness. They are easily replaceable in case of damage. Diameter of head ranges from % in. for a 1/4 in. screw to 1 in. for a 3/4 in. screw. The heads are sufficiently chamfered at the bearing end to allow touching off with a grinding wheel after the screws are assembled. Because the screws used are threaded to the head, only a slight counterboring operation in the diameter and depth is necessary for proper head contact. The threads are made to a class 3 fit and once threaded securely, should remain tight and not loosen.

Half dog point socket screws, as shown in Fig. 10, may also be used as jig supports. As in the case of socket head cap screws, these dog point screws



Fig. 11 — Drawing showing use of steel pipe plug as a rest pad.



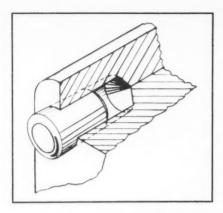


Fig. 12—Drawing showing application of taper pin for use as support member.

are made of alloy steel and toughened by heat treatment. In the illustration shown, a hex jam nut is used against the body of the jig so that proper alignment of the four supports is obtainable without the necessity of touching off the ends with a grinding wheel. Although not shown, another means of locking the dog point screw has been used. The hex nut is dispensed with and another socket set screw of any headless type is used behind the supporting screw. However, adjustment is not so easily accomplished as when a hex nut is used because the locking screw must first be removed when adjustment takes place. This is especially true if the thread is a snug



fit in the hole. If the jig body is of considerable height, the hole accommodating the screw is coun-



terdrilled, leaving only enough threads for the screw or screws. In such an instance, a special hex wrench must be used which is longer than the wrenches usually supplied with this type of screw.

In Fig. 11 a steel pipe plug was used as a rest pad because the designer wanted a permanent assembly with no thought of removal or replacement. Here he took advantage of the ¾ in. taper per foot of the pipe thread. In this instance, a ¾ in. pipe size was used which is 1.050 in. in diameter at the large end. It is ¾ in. long, 9/16 in. across the flats hex hole and is purchasable. A length of 35/64 in. is re-

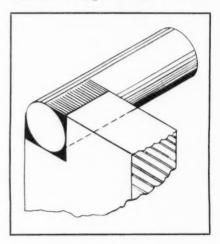


Fig. 14—Drawing showing conventional methof welding round steel support to jig plate.

quired to make a tight or wrenched thread joint. Only 5/64 in. of length protrudes and 1/64 in. is allowed for true-up grinding. The end of the plug is chamfered. Such steel pipe plugs, which are made by socket head cap screw manufacturers, are available in sizes of ½ in. through 1 in. pipe.

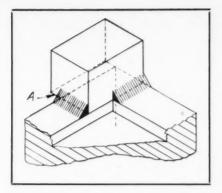


Fig. 15—Drawing showing method of welding steel block to base plate to provide for one, two, or three way support.

These manufacturers also make straight dowel pins which have been used as supporting elements in jig and fixture designs. The pin is pressed into a reamed hole until it bottoms. Thereafter the four pins are ground off for squareness. It was found that if an air escape was not provided for in the reamed hole, sometimes the pins would not bottom in the hole, necessitating more grinding on one pin end than on another. These pins can be provided with a surface hardness of Rockwell C

scale 62-64 with a 52-54 core hardness. All diameters which are furnished as standard from  $\frac{1}{2}$  in. to 1 in. are ground 0.0002 in. oversize for a press fit. These diameters are held to  $\pm 0.0001$  inch. One end has a flat

radiused end, the other is ground to a 10 deg. included angle for a short distance to facilitate entering the hole.

Taper pins having a taper of ¼ in. per foot have been used. While any length can be used if the space is sufficient, the illustration Fig. 12 shows a comparatively short one. It enters the base for a length equal to its large diameter and protrudes about 3/16 inch. After the four pins have been driven in they are surface ground to form a flat on the rounded end as shown. If the pins are to be removed, two flats can be ground on the protruding end to accommodate a wrench. In this instance the pins are hardened. In the design shown, a No. 8 taper pin is used having a large diameter of 0.492 inch. The height of the radiused end is approximately 1/16 in. and a % in, diameter flat was ground on this radiused end as shown. About 3/64 in. in height was ground off thereby leaving an approximate 30 deg. chamfer by 1/64 in. high which operated satisfactorily on the drill table.

#### Welded Supports

Fabrication by welding is used to a great extent for large fixtures. There

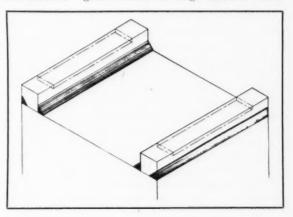


Fig. 16 — Drawing showing application of square steel stock to provide support along one entire side of jig.

are numerous methods and types of supports that are available to the tool designer, a number of which are illustrated and discussed. Round, hex, square and rectangular stock is used. Steel plate is sawed out to form supports. Structural steel also has its place in jig and fixture design, and in fact it is used to a great extent for supporting members.

A piece of square cold drawn steel, as shown in Fig. 13, may be used. The top end is generously chamfered to accommodate the melted welding rod material. It is first clamped in position usually at the corner of the jig base plate and then welded or brazed on.



Fig. 17 — Drawing showing use of carbide insert as support.

The other end is also chamfered but less than the top end. Because of the welding heat, grinding of both the plate upper surface and the bottoms of the legs is necessary. In this in-

stance, the four legs were heated locally and cyanided for skin hardness after grinding.

In Fig. 14, the corners of the jig plate are band-sawed and a piece of round steel stock welded into the cut out corners of the plate. This, of course, may take several forms in that the support can be made of square stock so the complete corner is filled and squared. This method is convenient if double-ended legs are required.

A steel block is used as a support in Fig. 15. It may be welded to the base plate so that a one, two or three way jig results. In the illustration, a two-way support is portrayed. The

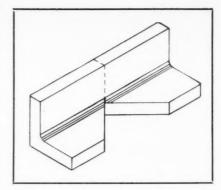


Fig. 18A—Drawing showing use of structural angle iron for right-angle support.

block is so set that it overhangs the plate at **A.** If a three-way arrangement is required, the right hand end would overhang also for about ¼ inch. The block may be welded along the inner sides as shown and also outside along the overhanging edges if desired.

Sometimes the square steel stock is welded for its entire length, as shown in Fig. 16, to form two parallel slides. This is usually for short distances only. If the span between corners is comparatively long, the middle of the square parallel is relieved by sawing or milling out to a depth of approxi-

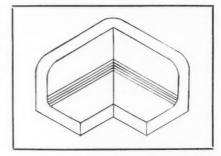


Fig. 18B—Drawing showing completed angle iron right-angle support.



Fig. 19 — Drawing of channel iron which may be used as support.



mately & in., thereby leaving

small pads at the corners as shown by the dot and dash lines.

Tungsten carbide tool inserts are used as supporting elements where long life is required. See Fig. 17. There are various forms from which to choose as listed in the manufacturers' catalogs. This material is usually brazed on or held with a silver and copper sandwich. Pieces of 1/32 in. or 1/16 in. thickness or thicker may be used if desired. It is easier to grind off

the upper surface of the plate rather than the carbide pads when truing-up. However, the pads may be ground with a diamond grinding wheel.

In Fig. 18A, a piece of structural angle iron is used for a right angle support. A piece is cut to length and at the center of one leg, a 90 deg. cut is made. At the apex of the cut-out, the other leg is bent to a right angle along the dotted line thereby clos-

ing up the cut-out as shown in Fig. 18 B. This joint need not be welded as it will stay in place when the piece is welded to the base of the fixture. The corners of the bearing surfaces are ground off at a bevel or rounded, as shown.

A piece of small channel iron has been used as a support as shown in Fig. 19. If four pieces are used as supporting members, eight bearing surfaces result which is not objectional on large fixtures. The upper edges are chamfered at 45 degs.—approximately 1/2 in. x 1/2 in. to accommodate the weld. The lower edges are rounded.

Small angle iron sections are used for double-ended supports shown in the illustration Fig. 20. They are welded around the corners of the steel

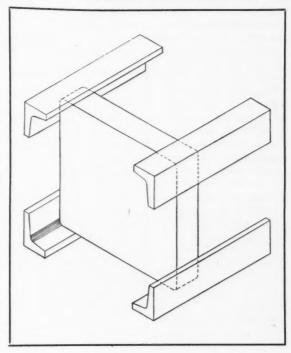


Fig. 20 — Drawing showing application of small angle iron sections which provide double end support.

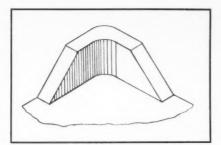


Fig. 21—Drawing showing construction of supporting elements on cast iron jig body.

plate. Whether or not the inside faces of the angle iron are tapered, the steel plate need only be squared and the corners rounded or chamfered before welding. The welder can centralize the angle iron during the welding operation. The plate is then first squared up and the ends of the support surface ground simultaneously at each end for the proper bearing surface.

The supporting elements of cast iron jig and fixture bodies,

c ast integrally with bodies are varied in design. Small square finished pads  $\frac{1}{16}$  in. to  $\frac{1}{8}$  in. in height are sometimes ground at each corner of the main piece especially when the jigs are small. On larger pieces, the supporting portion is made larger, such as the right angle bearing surface shown in Fig. 21. This type usually is at the outer

corners of the body and can be made any height. It makes a rugged substantial support because of its shape.

Jigs and fixtures, but more especially drill jigs, are made for two, three, and four way use, whereby drilling is done from several directions. In cast iron jigs, as shown in Fig. 22, the wall is merely extended to form the relieved supports. The bearing surfaces of the extensions may be placed where desired. In this instance, the pads are chamfered at two edges for ease of movement. Other sharp edges are touched off with a file. This is a fourway fixture.

The fixture illustrated in Fig. 23 is merely a combination of the support shown in Fig. 21. It is shown as a three-way jig.

Weldability of Metals. Reprinted from the 9th Edition of "Procedure

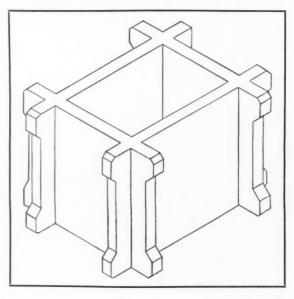


Fig. 22 — Drawing showing method of providing supports on cast iron drilling jig.

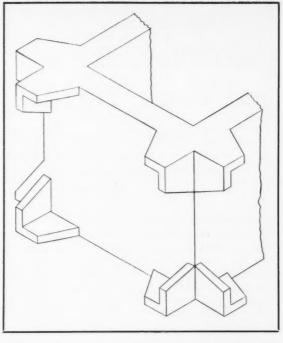
Fig. 23 — Drawing showing method of providing supports on a cast iron three-way drilling jig.

Handbook of Arc Welding Design and Practice." Published by The Lincoln Electric Co., Cleveland 17, Ohio. 41 pages. Price, 50 cents in U. S. A.; 75 cents elsewhere, postage paid.

This book provides the answers to questions of how to weld ferrous and non-ferrous metals. The various types of carbon and alloy steels are described by giving nominal chemical analysis, properties, uses, and characteristics. The best welding procedure

for each is completely detailed. American Welding Society specifications for electrodes used to weld are also provided.

This same treatment is given to copper, aluminum, and nickel, as well as their various alloys. Cast iron, forgings, cast steel, wrought iron, ingot



iron, galvanized steel, terne plate, and enameling stock are also discussed at length. A thorough analysis of the principles and practices of hard surfacing is also presented. Complete tabular data, drawings, and pictures supplements the text of the Procedure Handbook.



## Boring Mill Characteristics and Work, Part III

By JOHN E. HYLER

This author's discussion covers horizontal boring mills, including their design features, available types of construction, jig boring facilities, and different styles of tables.

H ORIZONTAL boring mills, or horizontal boring zontal boring, drilling, and milling machines as they are often called, are very different in construction and operation from vertical boring mills. Horizontal boring mills are usually employed for a completely different type of work than vertical boring mills. On the former machines, the work remains stationary, and the boring bar revolves. Turning is a function only insofar as it may be done with a facing head or similar arrangement, turning or facing flanges or similar surfaces where such operations can be advantageously performed in connection with other work on parts being machined.

Parts handled on horizontal boring mills are generally large in size, and may require boring or drilling one or a number of holes. Facilities are necessary for adjusting relative positions of workpiece and spindle laterally and also with reference to height. In the past, some horizontal boring machines were made with vertical table adjustments. However, it has been found more advantageous to provide the boring spindle with adjustment for height,

and this is the construction universally employed on present-day units. Consequently, a rigid column is incorporated on practically all horizontal boring mills, the column being provided with vertical ways on which a spindle head is mounted. The spindle head contains the necessary mechanism for driving the spindle proper, and the spindle (or a boring bar driven by the spindle) accommodates cutters or a cutterhead for boring. On some machines, a feeding movement is provided to the boring spindle. In others, the sole feeding movement is incorporated in the workholding table. Lateral motion for adjustment may be, and often is, provided in the work-holding table, a compound or four-way table sometimes being furnished.

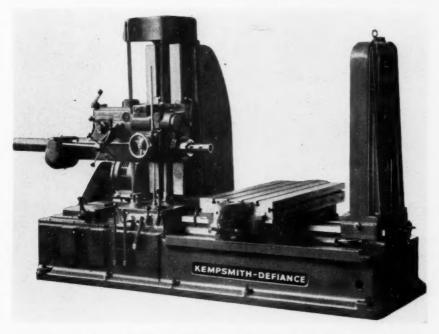
#### Wide Lateral Adjustment with Planer-Type Tables

The idea of lateral adjustment has been extended greatly on planer-type horizontal boring, drilling, and milling machines. In this case, very large workpieces are supported on a long table of the planer type, making it possible to traverse them past the boring spindle at a right angle. Some very large machines of this kind have the column which supports the boring spindle mounted on ways, allowing it to be traversed at a right angle to the travel of the planer-type table.

On so-called floor-type machines (which are used for boring parts so heavy that it has been found advantageous to have the work more rigidly supported) the vertical column is mounted on a transverse runway which allows the spindle to be adjusted to any desired point either vertically or laterally while the work remains stationary. In this case, the spindle must also have a longitudinal movement for boring, drilling, or milling. Horizontal boring, drilling, and milling machines are of-

ten provided with a boring bar support carrying a bearing which may be adjusted both laterally and vertically to align with the bar when necessary.

The possibility of drilling, reaming, and tapping holes with accurate spacing without the use of jigs or fixtures is one factor which makes some of these machines highly useful. Milling is often performed by placing milling cutters directly on the spindle. Right-angle milling is also possible in many cases, using special angular milling heads provided by the manufacturers of these machines. The ability to mill a workpiece while it remains in the same position in which it was bored, drilled, and so on, often saves a large amount of time, making it unnecessary



Shown here is a horizontal mill which is designed for performing a wide variety of boring, drilling, and milling operations. Illustration courtesy Kempsmith Machine Company.

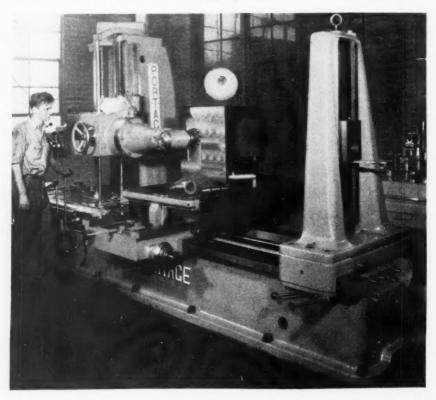
to handle and locate the workpiece a second time at a different machine.

#### Wide Range of Machines

Horizontal boring mills are available in a wide range of spindle sizes, column heights, and table sizes. This fact makes such a machine suitable either for small tool and die work or for large and heavy workpieces found in steel mills, oil fields, railroad yards, shipyards, and plants of builders of heavy equipment. Some machines of this type incorporate automatic power positioning. Automatic power positioning is particularly advantageous on long-run operations or for fast setups for single applications. Special attachments and tooling are often applied to such machines, increasing their range and scope for irregular types of work.

Still other machines incorporate dial indicators for use in manual positioning. One dial indicator is used for the

Standard horizontal boring mill with 4-inch diameter bar, 36-inch column, and 36 x 60-inch table being used on a vertical face milling job. The machine is equipped with an angle milling attachment that can be rotated in a 360-degree arc for milling at any angle, although its most common use is at 90 degrees, 180 degrees, and 270 degrees to the table top. It can be mounted to or demounted from the spindle nose in a matter of minutes. Illustration courtesy Portage Machine Company.



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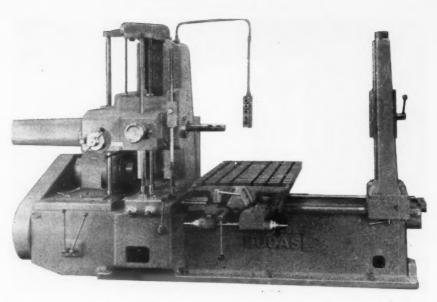
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This illustration shows a horizontal boring mill equipped with a two-way bed and a dial indicator for positioning the head and the table. Operations are controlled through push buttons in the multi-position electric control pendant. Illustration courtesy Lucas Machine Division, New Britain Machine Company.

spindle head and another indicator for the adjustable table of the machine. An adjustable abutment is provided for each indicator. Where this system is used for head positioning, a vertical shaft with V-groove and spring clips is employed. This vertical shaft accommodates end measuring rods and a micrometer corresponding to the vertical distance between settings. For worktable positioning, a trough is provided on the left side of the saddle for end measuring rods and micrometer corresponding to horizontal distances between settings. Spring-loaded plungers are employed which ensure uniform contact with all end measures used without danger of springing the mechanism.

Automatic power positioning affords highly accurate control of both head and table through power feeds to predetermined settings. When fine feeds are selected, automatic power positioning is sometimes accurate to within tenths of an inch. One automatic control mechanism makes use of indicators and rods, very similar to the manual positioning arrangement. In addition, however, it combines electrical controls which automatically stop the unit at a predetermined setting.

Where a machine is provided with automatic power positioning, the entire operation of setting the head and table is accomplished through power feed and the electrical controls. The operator has only to insert the correct rod and allow the machine itself to do the precision setting automatically. On many production jobs, dril! rods



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KNOB INSERT. Metal: 17%" round aluminum • Machine: model 61 15%" New Britain Gridley • Operations: cross stide—form, knurl, cut off; tool stide—spot drill, tap, ream, recess • Spindle Speed: 1,600 rpm • Feed: 005" per revolution • Tools: high-speed steel • Cycle Time: 7 seconds

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may be cut to lengths corresponding with precise spacings desired between settings. In jig and fixture work, standard end measuring rods and inside micrometers are used.

#### Jig Boring Facilities

For jig boring and other high-precision work, the columns of some horizontal boring, drilling, and milling machines can be fitted with special equipment. One such arrangement incorporates an assortment of precision end measures; a micrometer with one inch of adjustment in ten-thousandths of an inch; and an indicator. Using the

end measures and micrometer, it is possible to make up combinations for measuring any decimal part of an inch, or number of inches, up to the maximum adjustment of the spindle head on the column. When in use, the micrometer and end measures are firmly held in position on a vertical bar. The indicator is mounted in a case attached to the spindle head.

The metal indicator case is provided with a spring plunger which assures uniform end pressure against the micrometer and end measures at all settings. The case also incorporates safety provisions which prevent damage to

the micrometer or indicator when making adjustments of the spindle head. A similar attachment can be applied to the table to provide for extremely accurate cross ad-

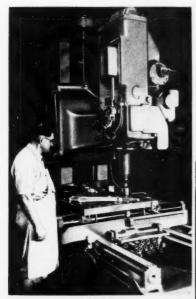


Interesting view of a floor - type horizontal boring, drilling, and milling machine equipped with a floor plate and a large adjustable table. machine, which is in-stalled at Hoover Tool & Die Co., De-troit, Mich., is shown being used for milling and boring indexing slots and holes on a special job. Two parallel slots 13 feet long and 8034 inches apart were milled with a tolerance of 0.001 inch. Illustration cour-Cincinnati Giltesv Machine Tool Company.

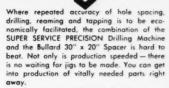
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### DRILLING



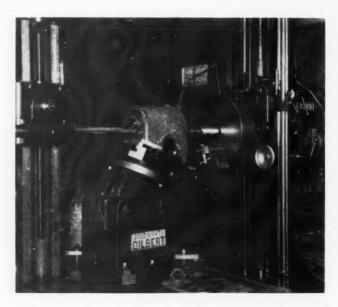
Precision production work without the use of jigs, at Lockheed, is now being accomplished on the Cincinnati Bickford PRECISION Drilling Machine, equipped with a Bullard Man-Au-Trol Spacer. A variety of production jobs, such as cutting holes approximately 3" in diameter, through curved plates of magnesium about \$5" thick, are now being economically produced without the use of jigs. First, a \$/16" hole is used as a pilot hole for a fly cutter. The total tolerance on the diameter of the accurately located holes is .001". According to Lockheed, "Fast, repetitive drilling is handled without the use and expense of jigs - heavy parts including castings are automatically positioned under the jig boring type spindle parts handling is minimized - storage and maintenance of drill jigs are eliminated."



Ask the Cincinnati Bickford Tool Company, of Cincinnati 9, Ohio, or the Bullard Company, of Bridgeport 2, Connecticut, for further information about this natural combination.



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compound table type of horizontal drilling, boring, and milling machine is shown in the process of handling an unusual job, which required finishing of four sides, plus boring and counterboring a hole at a 30degree angle. To successfully perform this job, the machine was equipped with a twoway feed facing head and extension tool, a standard universal tilting and revolving table, and a midget boring bar support, can be seen which mounted on the machine work table to the left. The two-wayfed facing head shown at the right. Illustration courtesy Cincinnati Gilbert Machine Tool Company.

justment. The same machine may also be fitted with a microscope featuring built-in electrical illumination. The use of a microscope permits the user to profit from the basic advantages inherent in a straight-line measuring scale.

For some machines, a combination dial and end-measuring instrument and vernier attachment can be provided for vertical travel of the spindle head, cross travel of the table, and vertical travel of the boring bar support.

#### Magnetic Clutch Provides Precise Positioning

Close electrical control of the positioning equipment of some horizontal boring mills is made possible through the use of a magnetic clutch for final precise setting. Measuring or job rods are employed in connection with this equipment. Conventional end measuring rods are used where a single part

is to be bored, while special job rods are employed for production work. The job rod, where used, has a number of bored spacing holes on each of its four sides to receive stop pins for the purpose of easily duplicating various settings.

After an operator has determined what his setup is to be and has placed the rods in position, he connects the directional controls on the machine. Thereupon, the machine table and headstock move rapidly toward the desired setting until a selector switch disengages the directional clutches. The arrangement is such that both the table and headstock travel slightly beyond the point where they are to be positioned finally. As they travel past the point where they are to be set, a special electrical switch is energized. This switch completes a circuit, which cuts into service a small constant-speed motor provided with a reduction gear

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unit. The reduction gear is connected to the machine feed screw through the magnetic clutch mentioned above. By this means, the feed screw is revolved in a reverse direction, by fine feed, to a point not further removed than 0.0005 inch from the desired machine setting. As this accurate setting is arrived at, the magnetic clutch is automatically disengaged.

### Special Built Units Are Sometimes Advisable

Where a horizontal boring, drilling, and milling machine is being purchased for use in a given plant, it is wise to give careful consideration to the largest and most unusual work to be handled, consulting with the manufacturer from whom the machine is to be purchased. Standard ma-

chines of this kind have a definite practical working range, but there are times where jobs to be performed may require a certain amount of additional vertical height, possibly longer or wider workholding tables, a somewhat greater - than standard cross travel, or longer bed lengths.

Usually machines meeting such unusual requirements must be built to order. Otherwise, it is quite possible that because of one particular job in a plant, a standard machine much larger than actually necessary might be selected and used. It is generally true, at least within limits, that a ma-



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as holder and locating fixture
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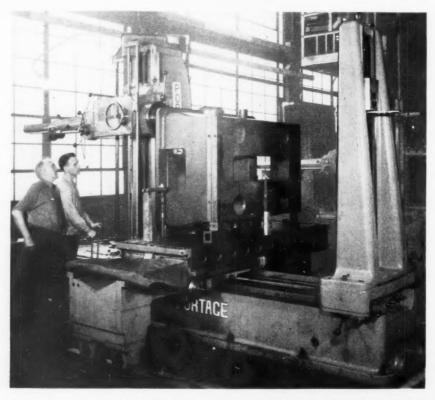
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chine which is very much oversize for the average run of work being handled is more unwieldy than a smaller unit. Consequently, production will suffer or bored with their axes at various angles. In such instances, swiveling or rotary tables, available from most manufacturers of horizontal boring



This horizontal boring mill has a 4-inch diameter bar, a 60-inch column, and a 36 x 96-inch table. The long table has auxiliary rails in the floor to provide added support when it is loaded with heavy work. The casting being machined is a bed of a 90-ton Brandes high-speed press built by Portage Machine Company. This boring mill is also equipped with dial indicators and measuring rods which enable the operator to do precision jig boring. Note canvas cloth covering the ways of the saddle for keeping off chips and dirt. Illustration courtesy Portage Machine Company.

to at least some degree from using a machine much larger than necessary.

In many cases, workpieces handled on machines of this kind have all their bored and drilled holes with axes parallel. However, there are many instances where holes must be drilled mills, should be employed. Some manufacturers provide swiveling tables of both hand-operated and power-driven types. From an economical standpoint, it is good practice to have extra tables on hand which will facilitate accurate positioning of angular setups without

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FACTUAL TEST (see illustration at left) made before secondary operation. Heavy lines equal .001"—light lines equal .0002". Gear made .004" undersize to allow for secondary operation.



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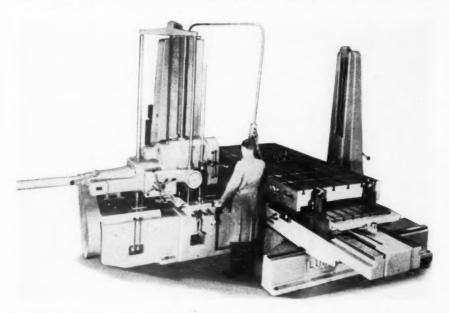


the necessity for unclamping and resetting the workpiece.

#### Different Styles of Swiveling Tables

Many sizes of circular, square, and rectangular tables are available for such purposes. On tables made by some manufacturers, a long lever extends be parallel with (or at 90 degrees to) the T-slots of the main table.

To facilitate the milling of curved surfaces, curved slots, and so on, a power-driven rotary table is often used. Such tables are available in various sizes. They may be either circular or square and may have their



The boring mill shown herewith is equipped with a four-way bed and a five-inch spindle. Operations are controlled through push buttons in the multi-position electric control pendant shown. A machine bed is in process of being machined. Illustration courtesy Lucas Machine Division, New Britain Machine Company.

through the front of the swiveling table base. This lever is operated to raise the table a few thousandths of an inch off the scraped surface so that it can be easily revolved on a ball thrust bearing. In most instances, the work will be swung through 90 degrees. On many tables of this type, a taper lock bolt fits into four taper bushed holes which are so located that the resultant 90-degree positions will

feed rate varied. One efficient arrangement makes use of a shaft, extending from the rear of the rotary table, to which a motor drive mechanism is coupled. The motor drive mechanism consists of a clutch arrangement for driving the table through a chain of feed kick-off change gears. These change gears make it possible to vary the feed rate. In addition, a second clutch is provided which is used for

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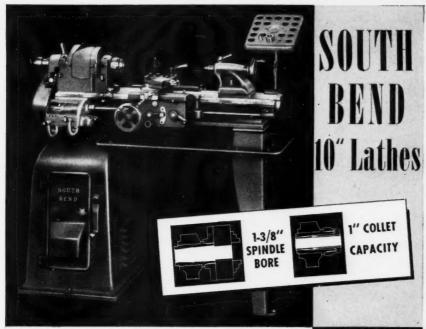


quickly traversing the rotary table from one position to another, as the need arises. Five push-buttons are provided on the table base for controlling table operation. Two of these buttons are for rotating the table to the right in feed or in rapid traverse. Two other buttons are for rotating the table to the left, either in feed or rapid traverse. The center button of the five is used for stopping the table. Adjustable dogs are positioned around the rotary table. These dogs may be set to trip the feed at any desired position. There is also a hand adjusting shaft having a dial graduated to read in minutes of an arc. Where desired, such a table may be provided without a motor drive and used for hand-positioning operations.

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# Magnetic Particle Weld Inspection

By GILBERT C. CLOSE

This article explains certain principles of the process and how they may be utilized to detect defects in ordinary fusion welds in ferrous materials.

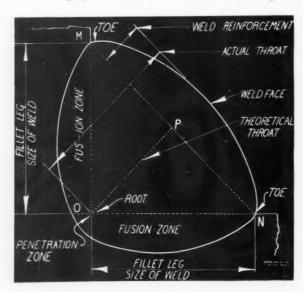
TODAY, when a design engineer inscribes the words "Weld Here" on a blueprint, he can do so with the utmost confidence that the weld, after fabrication, will withstand the stress loads for which it was designed. This is a relatively new experience. Not too long ago, all welds were regarded with a degree of suspicion, and few were called for in critical structures where failure might lead to dire consequences.

The current sharp increase in the use of highly stressed welded struc-

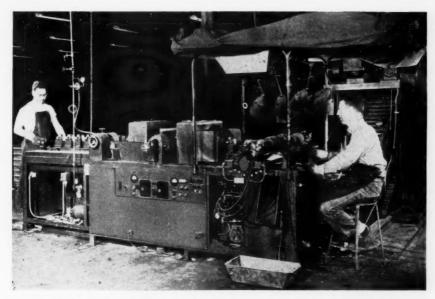
tures can be attributed to the concurrent development of dependable non-destructive inspection techniques which assure that each weld is sound and without mechanical or metallurgical defects. While many such non-destructive inspection techniques are now available, the two most commonly used in weld inspection are X-ray and magnetic particle inspection.

X-ray has been available for some time, but the cost of equipment, the cost of film, and the time consumed in the process limited its application

to specialized uses. Magnetic particle inspection, too, has been available for some time, but only in recent years has this process proved its value as a medium for the non-destructive inspection of welds. Early attempts to inspect welds via the magnetic particle method led to confusion and



Nomenclature of a fillet weld.



Large production machines like the one shown here are now available using the ''black light'' method of magnetic particle inspection. They also can be employed for inspecting welds.

conflicting opinions due to the numerous non-relevant indications obtained. This status persisted until the outbreak of World War II. Then suddenly, the huge aircraft companies were faced with the job of inspecting each day thousands of welds in chrome molybdenum steel airframe assemblies.

The only answer to this mass production problem was correlation of welding metallurgical knowledge with magnetic particle inspection techniques in such a manner that dependable results could be obtained. R. R. Moore, of the Naval Aircraft Factory, Philadelphia, was an early worker along this line and did much to solve the numerous problems involved. His work was supplemented by the magnetic particle inspectors in the various aircraft plants and by the manufacturers of magnetic particle inspection

equipment. Today, by proper correlation of knowledge concerning weld metallurgy with magnetic particle inspection techniques, consistent and dependable results are obtainable.

With this brief historical picture as a background, it is the purpose of this article to explain certain principles of magnetic particle inspection and how these principles may be utilized to detect defects in ordinary fusion welds in all ferrous materials. The information is based on the extensive research conducted in several large aircraft plants, but is applicable to all industry insofar as the inspection of fusion welded ferrous materials is concerned.

To begin with, it should be pointed out that any magnetic particle inspector engaged in the inspection of fusion welds should have a keen knowledge of welding metallurgy and the



This portable Magnaflux unit can be wheeled to any place along the production line or in the shop. This also is a "black light" setup. The magnetic particles glow when under the rays of the "black light."

types of defects characteristic of the welding process. Minus such knowledge, he will be at a loss to interpret the many magnetic particle patterns that form during the process of inspection and that may or may not indicate a true fault. False indications may be caused by the roughness of the weld bead itself, by feathered edges along the toe of the weld, or by minor inclusions that do not seriously interfere with weld strength. The ability to distinguish between such patterns and those indicating a dangerous fault is necessary, but easily obtainable by study and experience.

The principles upon which magnetic particle inspection units operate are not new, but are an adaptation of fundamental magnetic theory. In the routine shop inspection of welds, parts to be inspected are placed in the unit and

strongly magnetized by a highamperage current passed e i the r through a conductor arranged in such a manner as to induce strong magnetism within the mass of the part. In the field in spection of welds, portable current generat-

ing units with prod-type contacts are generally used.

It is a well-known fact that magnetic flux tends to congregate in the medium offering least resistance to its amplitude. Thus, when a magnetic substance such as a ferrous metal is situated within the magnetic field of the inspection unit, the flux lines congregate within the metal mass, and there is little external indication that a magnetic condition exists. When, however, there is a sudden change in the continuous cross-sectional area of the part, such as might be caused by a crack, a non-magnetic inclusion, or a peculiarity of design, the flux lines passing this point tend to become distorted. Some of them will be deflected through the surface of the part and external evidence of magnetism will result. This condition is shown graph-



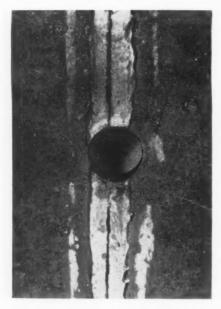
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ically in the accompanying drawing.

When magnetic powder, either dry or in liquid suspension, is applied to a part with external evidences of magnetism, the minute particles are attracted to the area where this magnetism exists and form a pattern



A typical weld fault running the length of the weld bead as revealed by the black magnetic particle line.

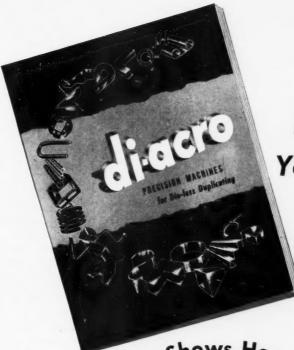
according to the nature of the deflected flux lines. The amount of magnetic powder attracted to a specific area and the shape and density of the pattern formed indicate to an experienced magnetic particle inspector the size and character of the underlying fault. In fact, the entire success of the process depends upon the operator's ability to correctly interpret the powder pattern in terms of fault characteristics. This is why in weld inspection a complete knowledge of welding metal-

lurgy and common weld faults is necessary.

The average weld bead has a rough, dark surface, marked by sharp irregularities of contour. As might be expected, this rough exterior distorts the magnetic field in such a manner as to produce many exterior powder patterns where no actual fault exists. The big job facing the inspector is to distinguish between these non-relevant indications and indications that reveal the existence of a true fault.

When the inspection is critical, some pre-inspection preparation of the weld bead is recommended. The bead must be dry and free of scale and slag so that powder patterns can form undue interference. Vigorous wire brushing of the weld bead, or sand or grit blasting it, will aid in this respect. When a bead is unusually rough, the high spots may be knocked off with a portable grinding wheel. Attempts have been made to "fill" weld bead roughness with paste or paint, but such a practice is not recommended. When the welded part will be machined over the weld bead area, machining prior to inspection will vastly improve the surface. Of course, when such a part must be rejected due to a defect, the machine work is lost. In some cases, such parts are inspected before machining for more obvious faults and then inspected again after machining as a final check.

One of the most common welding errors is failure to obtain proper penetration at the root of the weld. Unfortunately, due to its distance from the surface of the part, this fault is one of the most difficult to detect by magnetic particle inspection methods. Lack of penetration is caused by failure of the root face metal to attain a



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Electric prods are shown being used to magnetize a section of a welded steel tank. The magnetic particles, which in this case are being used in the dry or powder form, are projected from the blow gun held in the front worker's left hand.

melting temperature, with the result that, as the weld cools, the cast metal shrinks away from the root face section and a void is formed. During service loading, these voids become the center of stress concentrations and are very apt to result in ultimate failure.

During magnetic particle inspection, extreme care must be exercised in searching for patterns that reveal possible non-penetration defects. The powder pattern formed over such an area will usually be thin and feathered near the edges. Its size and shape will approximate a projection of the underlying void. This pattern, however, will tend to be more evenly distributed than false patterns caused by surface roughness which tend to be wavy in

design. When an even dark pattern is formed, and continues to form. over a specific weld area, it is logical to assume that lack of penetration is present. When such patterns persist on parts that are critical and costly, it may be more economical to sub-

stantiate results by X-ray inspection. However, for the average run of parts, rejection for rework will be the most economical way.

Another common welding fault is failure to obtain penetration through the fusion zone of the weld. This results in a deep-seated crack caused by shrinkage of the weld metal away from the base metal during cooling. In this case, however, the crack will be much nearer the surface, and the powder pattern formed will be clear and sharp in outline. There is no difficulty in detecting this type of fault; however, there is some chance that certain non-relevant indications may lead to the wrong conclusion. Often a featheredge of unfused metal will exist

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Typical weld faults (the black lines circled with a white mark) in a welded aircraft engine mount. The large aircraft companies use magnetic particle weld inspection for such critical areas as those where weld failure might result in the loss of an airplane and all aboard.

along the "toe" or edge of the weld crater. This featheredge in itself may cause an indication to occur that is very similar to the indication caused by lack of penetration through the fusion zone. The safe way in such cases is to grind away any featheredges that

exist and then reinspect the weld. If a magnetic pattern forms again after grinding, lack of penetration through the fusion zone is almost a certainty and the part should be reworked.

Oxide inclusions are other common weld faults. Some such inclusions result from heavy oxides that form and that are insoluble in the weld metal. In other cases, when the welding temperature is too low, the weld metal solidifies before the oxides have time to float to the surface, thus trapping them in the weld metal. In either case, such inclusions, when large, constitute weakening defects that may result in ultimate failure of the weld.

The magnetic particle pattern projected by a subsurface inclusion depends largely on the depth of the inclusion within the weld metal. Shallow inclusions will cause the pattern to form quickly and exhibit sharp outlines; deeper inclusions will produce a fainter pattern that tends to feather thin near the edges. When such pat-

terns form and an inclusion is suspected, the immediate area should

be ground smooth and then reinspected. If the pattern reforms in the same shape and size as prior to grinding, an inclusion is definitely established.

This brings us to the subject of cracks, either in the weld metal itself or in the base metal adjacent to the weld. Such cracks are very common occurrences and are very dangerous to the part. The smallest of cracks will result in stress concentrations when the part is service loaded and may cause complete failure at a critical moment. The magnetic particle inspector should know why welding cracks occur and where they are most liable to form. This knowledge will aid in interpreting powder patterns and estimating the seriousness of the defect.

In welding, steel is first heated to the melting temperature. When the welding flame or arc is removed, the metal solidifies while still white hot, and in this condition it is practically devoid of ductility. Lack of ductility is caused by failure of the individual metal grains to cohere while still excessively hot. A slight stress at this time will cause the grains to separate, and air will enter along the grain boundaries. The net result is a permanent crack, or what is more commonly



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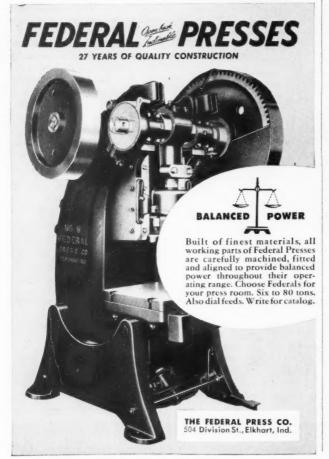
A second type of crack common to welds is caused by expansion and contraction of the base metal during and after welding. These cracks frequently occur when metals of different cross-sectional area or thicknesses are being joined. The greater heat conductivity of the thicker section cools it more rapidly, and the stresses generated by this unequal contraction rate between

the two weld components will often cause cracks in the base metal near to and somewhat parallel to the edge of the weld bead.

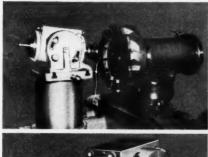
Other cracks may occur due to incorrect jigging of the parts during welding. The jig must be sufficiently flexible to allow for expansion and contraction without placing stress on the newly formed weld. Rigid jigging may cause stress cracking at almost

any place along the weld. Another source of weld cracks is rough handling of parts while the weld is still excessively hot. Or when in a hurry, a welder may attempt to peen away oxides before the crater metal has had time to solidify sufficiently to withstand the hammer shocks.

Nearly all true cracks in the weld metal, or in the base metal adjacent to the weld bead, extend through to the surface and are relatively easy to find by magnetic particle inspection. The powder patterns are sharp, of perceptible height, and follow closely along the open mouth of the



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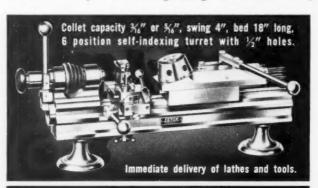
crack. But here again a single cursory inspection should not be relied on. When such a crack indication occurs, it is best to wipe it away and then examine the area closely with the eye or with a magnifying glass. Sometimes small cracks will be visible after their location is revealed. However, if no crack can be seen, the area should be ground smooth and reinspected. Reformation of the pattern after grinding

is certain evidence of a crack.

Certain techniques have been developed that aid materially in magnetic particle inspection of welds. In aircraft work, where every part is considered critical, it is common practice to employ both circular and bi-polar magnetism during the inspection of each weld. This is because a fault running transverse to the flow of magnetic flux will produce a strong ex-

ternal influence, while a fault paralleling the flux pattern will not produce a visible powder pattern. A bit of experimenting with each production part will soon indicate how connections should be made to obtain optimum circular and bipolar magnetism.

Magnetic particle inspection of welds is predicated so much on the experience of the inspector and his knowledge of welding metallurgy that instructions can be used as a guide only. But testimony that magnetic particle inspection of welds has been brought to a status of utmost efficiency and dependability is contained in the



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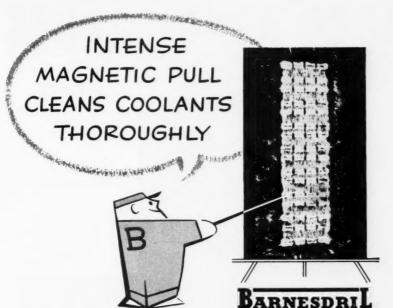
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fact that practically all major aircraft companies are using the process to inspect welds in cases where weld failure might cause the loss of an airplane and all aboard. Add to this the fact that the Army, the Navy, and the U. S. Air Forces have placed their stamp of approval on magnetic particle weld inspection, and have issued specifications to control it, and we have a conclusive case to justify its use.

In summarizing, it can be said that many companies are employing with great success the newer "black light" method of fusion weld inspection. In this process, the magnetic particles are coated with a fluorescent compound that glows when exposed to black light. Inspection is carried out in a darkened room, and the powder patterns are very easy to see due to their fluorescent brilliance under these conditions. But the patterns formed and the faults that cause them are just the same as when conventional magnetic particle inspection is used, and knowledge pertaining to the original process can be employed similarly when the fluorescent-type magnetic particles are used.



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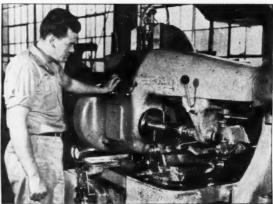
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METAL CUTTING TOOLS SINCE 1908

# "Hydro-Sizing" Proves Economical

By EVERETT JACKMAN

Large aircraft manufacturer effectively utilizes technique to finish-form externally-carried fuel tanks.

THE relatively new technique of hydro-sizing, wherein an expanding rubber bag rather than a traveling ram exerts the necessary forming pressure, offers many opportunities for the design and construction of inexpensive and efficient specialized tools. In many cases, hydro-sizing tools can be economically employed for forming a single part. This happened recently at the El Segundo plant of Douglas Aircraft Company when tooling engineers were faced with the problem of providing a tool for final sizing of an externally-carried aircraft fuel tank.

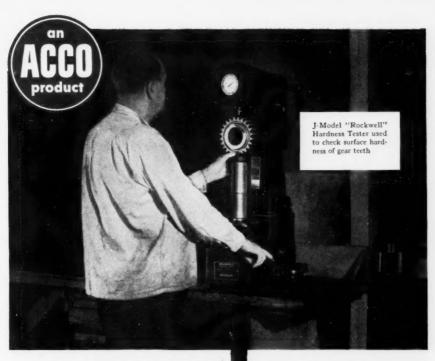
This tank, fabricated from 61 S aluminum alloy, required accurate external contours to maintain the required aerodynamical efficiency. A few tanks were successfully produced by spinning; however, this technique proved too costly for regular production. It was then decided to use "hydro-sizing" to finish form the tank to the desired contour tolerances.

In planning the project, it was evident that sizing would have to be the final operation. Some warpage would occur during heat treatment of the preformed tank halves; more would occur while welding the halves togeth-

er. Errors caused by this warpage, along with errors in the initial forming operation, would have to be removed during the final sizing operation.

To begin with, the 61 SO material is drop-hammer formed into half-shell sections. These sections are then rough trimmed so that they will fit into a trim saw fixture, which assures a true and straight butt joint as required by the subsequent automatic heliarc welding operation. A fixture similar to the trim saw fixture is used in the automatic welding operation. Pneumatic-operated lever clamps hold the part firmly against a contour support block. A formed copper bar imbedded in this support block backs up the weld bead and aids in heat dissipation, thus minimizing warpage insofar as possible. The fixture indexes the tank skins with a maximum clearance of 1/32 inch along the butt weld joint area. To keep the automatic welding torch at a constant and optimum angle with the work surface, the torch is attached to a follower arm which, in turn, operates against a template that conforms to the shape of the tank.

As soon as practical after welding, the tanks are heat treated to the "W"



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condition and then placed in sub-zero storage to await final sizing. This sizing is accomplished within 24 hours since the elasticity in the welded area grows progressively less with age.

The "hydro-sizing" mold is made up in two halves, each cast from a high

point out that at 500 p.s.i., the mold enlarged slightly, and if this enlargement was to occur during the actual part-sizing operation, it would make the part extremely difficult to remove from the mold. "A hydro-sizing mold of this type, especially one in which



This illustration shows the hydro-sizing setup. Two cast-aluminum sizing dies are used to speed the work. The die cover, mandrel, and rubber expansion bag are shown suspended by a one-ton air hoist located above the die at the right. Twenty-five gallons of fluid are pumped into the bag to obtain forming pressures of from 350-450 p.s.i. Tank sizing time is about five minutes floor-to-floor.

grade aluminum casting alloy. Aluminum was used in order to reduce the cost of machine operations in the final preparation of the mold. These halves are bolted together and have been hydraulically stress tested to 500 p.s.i., a figure substantially above the pressures used in the sizing operation. However, Douglas tooling engineers

the part is nested, must not enlarge or stretch under working pressures," one engineer pointed out.

A pneumatic piston at the bottom of the mold is used to eject the sized tank. This piston operates normally at from 100-200 p.s.i., with the booster pump set at a maximum of 400 p.s.i. Greater piston pressures might injure

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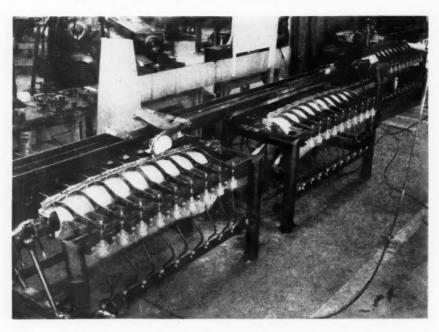
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or deform the tank during ejection.

The rubber bag into which the hydraulic oil is pumped is attached to a mandrel, which, in turn, is mounted on the mold cover. The size of the mandrel reduces hydraulic oil requirements to approximately 25 gallons.

is wrapped around the top edge of the tank before inserting it in the mold. This paper parting strip prevents any galling that might occur because of the like materials of both part and mold.

The mandrel-cover combination is



These trim saw fixtures grip the two drop-hammer formed tank half-shells firmly by means of pneumatically-operated lever clamps. The trim seam provides  $\alpha$  heliarc weld joint with a maximum clearance of 1/32 inch.

The mold cover is held in place by a series of quick-acting clamps of sufficient strength to withstand maximum sizing pressures. A one-ton air hoist located above the tool is used to extract the mandrel after sizing is accomplished.

In operation, the welded and heattreated tank is removed from sub-zero storage and then coated with No. 302 draw-press compound. A strip of paper

then locked in position by the quickacting clamps. Two index pins with spin nuts are used to position the mandrel on the mold. The hydraulic oil is then pumped into the bag to expand it and force the tank metal to conform to the contours of the mold. About three minutes are required to fill the bag and attain forming pressures ranging from 350-450 p.s.i. Due to initial accuracy of manufacture, the metal



Fast, economical, and satisfactory fabrication of stainless rubing calls for a close watch between its tough working properties and the production methods required to work the tubing to specific job required to work the tubing to specific job requirements. It is well to bear in mind that the large number of available stainless analyses vary widely in their hot and cold working properties, as well as in their chemical and physical characteristics. Matching the workability of both seamless and welded stainless grades to spinning, swaging, expanding, upsetting, bending, forming, and other fabricating methods is a specialty at BacW.

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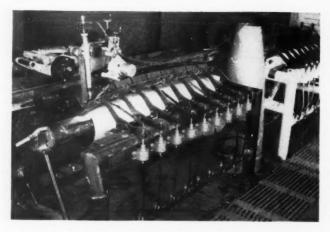
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This automatic heliarc welding fixture is very similar in construction to the trim saw fixtures. The automatic welding torchis guided by a template conforming to tank shape along which a follower arm travels as welding progresses.

elongation during this stretch sizing operation is held within 6 per cent.

Tank sizing time is about five minutes floor-to-floor. Previous time studies show that, using conventional straightening and sizing techniques, about 50 minutes per tank were required. The total cost of the tooling

was negligible in comparison with ramtype hydro-sizing equipment.

(The illustrations which appear in the foregoing article were furnished through the courtesy of El Segundo Division of Douglas Aircraft Co., Inc.)

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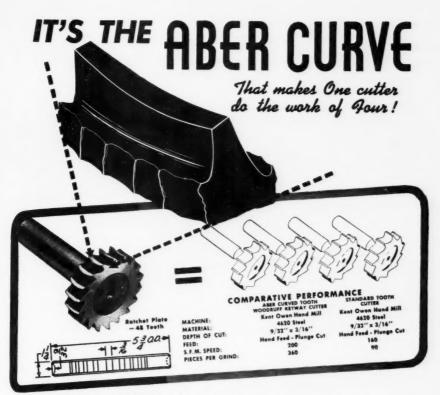
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# Pension Plans in the Machine Shop

By Robley D. Stevens
Management Consultant

Have you an employee-benefit plan? If not, the suggestions in this article may prove helpful in arriving at a decision.

THE establishment of employee-benefit plans through collective bargaining is a comparatively new phase in industrial relations. However, unions and employers individually have for many years operated such programs.



". . . pensions have been used by industry, government, and unions as one way of meeting the emergencies of old age."

Employers also have inaugurated pension plans and group life and health insurance programs.

Since the end of World War II, the government's wage stabilization program limited the amount of wage increases which employers could grant, but permitted the adoption of reasonable employee insurance and pension benefits. Early in 1945, the National War Labor Board held that employers should not alter or discontinue group insurance plans during the life of their union agreements. In some cases, the board ordered employers to include existing benefit plans within the agreement. Psychologically, such actions stimulated the growth of plans and also brought a number of existing employer plans within the scope of union agreements. Favorable income tax regulations applicable to employers who set up approved plans also contributed to the growth of health and welfare plans.

Should a pension plan be adopted by machine shop management? Well, pensions have been used by industry, government, and unions as one way of meeting the emergencies of old age. The U. S. Bureau of Labor Statistics recently estimated that "more than three million workers—over twice the number in 1947—were covered by some type of health, welfare, and/or retirement benefit plan under collective bargaining agreement by the middle of 1948."

Among the many industries in which pensions are covered by managementunion agreements are street railway,

Illustrations by Don Ritchie.

clothing, chemical, steel, paper, mining, textile, building trades, fur and leather, electrical machinery, food products, automobile, power, and communications industries. This in itself reflects the growing demand for pension plans. It is not always possible to determine solely why a pension plan should be adopted by machine shop management. However, because of the increasing demand for such plans, whatever their purpose, the subject requires careful evaluation. In any event, the significance of such a program will be differently viewed by the employer, employee, and union.

The major aspect of a pension plan in a machine shop is to increase efficiency through the retirement of older workers, thus attracting new employees. Other aspects include reward for loyal and faithful service, encouragement of continuity of service, reduction in labor turnover, improving employee morale, and so on. Maybe no pension plan will cover all these things, but some of them can and should be covered.

On the other hand, machine shop management may feel that the pressing of unions for a pension plan involves the small firm unable to support one. Some may feel that bargaining on pensions is not necessary. There are other views on this subject too. For example, machine shop workers are chiefly interested in pensions as a protection against old age. They probably feel, like employees in other industries, that they should be rewarded for long, efficient, and faithful service to machine shop management. Then too, unions are interested in pension plans as a means of aiding their membership to obtain this old-age protection among other factors.

Just what is a pension plan? Well, a pension or retirement plan provides regular periodic payments, or annuities, to employees who retire or who are retired from active employment service for one or a combination of reasons; i.e., the employee has reached the normal retirement age, has served a

minimum number of years, or has become permanently and totally disabled.

During the last several years, American industry has witnessed a wide growth and development of pension plans for numerous reasons. Usually, a



"... to increase efficiency through the retirement of older workers..."

pension or annuity is paid only if the retiring employee meets the age and/ or service requirements or is totally disabled. However, under some pension plans, other conditions for retirement are provided. For example, an employee retiring or otherwise leaving a company's employ before the normal qualifying period, but after a stipulated age or period of service, may receive a reduced annuity, beginning immediately on separation, or a deferred annuity, with pension payments beginning at the normal retirement age. If a plan is a contributory one, an employee on separation from service before retirement may choose between an annuity or a lump-sum refund of his contributions, with or without interest.

The subject of a machine shop pension plan is, of course, a very interesting one, as well as a vitally important one. Machine shop management, like

other types of employers, wants to know who will pay for it. The answer will probably always be far from being settled. Machine shop management

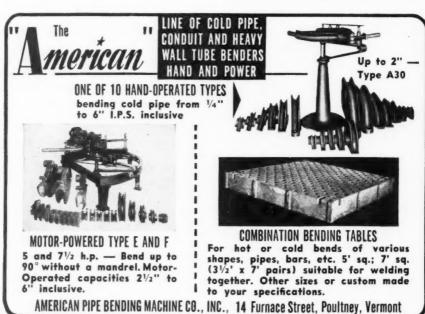


"Eligibility for participation in a pension plan is usually based upon . . ."

may view a pension plan as an additional labor cost. If, however, a pension plan will reduce machine shop labor turnover, improve morale, and increase efficiency, it has merit.

Eligibility for participation in a pension plan is usually based upon service, age, and, occasionally, upon union membership requirements. Pensions are paid to eligible employees who retire or who are retiring for age, length-of-service, or a combination of age and service. Usually, the normal retirement age is 65. A lower normal retirement age may be 60 for women.

Lump-sum death benefits, payable in the event a participating employee dies before, or shortly after, retirement, may be included in a pension plan. Compulsory retirement ages are prescribed by some contracts and forbidden by others. Some plans, however, under which the employee may continue in service beyond a compulsory retirement age with the employer's permission, do not permit accrual of service credit during extension. An em-





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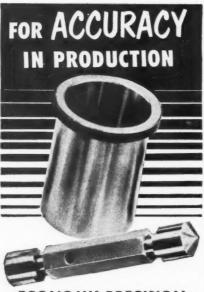
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ployee who, voluntarily or involuntarily, leaves the employer's service before he is eligible for retirement or who drops out of the plan often forfeits his pension rights.

The amount of a pension is an important subject to machine shop management for numerous reasons. Benefit a mounts are stated (1) as flat amounts, (2) as a fixed amount of percentage of income multiplied by years of service, (3) as the amount purchasable through an insurance policy with

contributions on hand, or (4) as the sum of percentages of various portions of the employee's average income. Thus, machine shopmanagement may pay a monthly pension of \$75 or more, depending upon the agreement reached.



"Financing a pension plan is another subject . . ."

Financing a pension plan is another subject dear to the heart of machine shop management. It might be a non-contributory plan. The contributions might be made solely by the company, or the employee might contribute 2 per cent of his monthly earnings up to a certain amount and a higher per cent after this.

The administration of a pension or retirement plan is another subject to consider. The plan might be administered by a committee, and so on. Undoubtedly, the effective date of a pension plan is extremely significant in determining both an employee's contributions and the service on which his pension will ultimately be based. Its commencement may be at various lev-



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els of thinking and action. It may require a minimum of 25 years of service or each employee to be 65 or over with a minimum of 15 years of service.

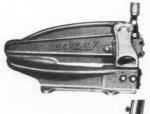
There can be no doubt that the negotiation of a pension plan requires careful study. In fact, legal counsel should be sought on the adoption of one, since, in view of the fact that all circumstances and results cannot be anticipated, the parties involved need this protection.

Since no one plan will fit the need of every machine shop, the final choice of it and the provisions thereof will depend upon the individual management. However, pension consultants and insurance firms have adequate talent to assist in such matters and might be consulted.

In view of recent developments, labor organizations have been stirred to sell businessmen on the idea of pension plans. Consequently, union interest in collective-bargained employee pension plans has been further spurred by the absence of health and disability benefit provisions and by the so-called inadequacy of retirement and survivors' benefits under the Social Security program.

The pension-plan seems to be the number one problem facing American industry. Machine shop management should be interested in the following aspects of pension plans which have special significance; The National Labor Relations Board's conclusion that retirement and pension plans are subject to matters which the employer must bargain with the statutory representatives of its employees was upheld by the Court of Appeals for the Seventh Circuit in the Inland Steel Co.

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v NLRB, 170 F. 2d 247. The court held that all retirement and pension plans, regardless of structure, are within the identical bargaining mandates of the original and amended acts which require the employer to bargain collectively with the representatives of his employees; i.e., the exclusive representative designated to bargain for them "in respect to rates of pay, wages, hours of employment, or other conditions of employment." In other words, the court agreed with the NLRB's view

that while these provisions do not specifically refer to the matter of retirement and pensions, benefits accruing to employees from such plans are clearly within the statutory concepts of "wages" and "conditions of employment" when viewed in the light of the purposes of the act.



"... machine shop management should not wait until it is forced to adopt one ..."

In conclusion, the matter of pension plans for employees in a machine shop—large or small—calls for careful thought. In the light of the foregoing cited legal case it would appear that the issue has been settled, that is, with regard to bargaining over pensions.

Has your machine shop management a blueprint for a pension plan? It may be closer than you think. In any event, machine shop management should not wait until it is forced to adopt one, but rather gather all the facts and data and analyze same. For example, it might consider such factors as membership requirements, employee con-



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MODERN MACHINE SHOP

tributions, employer contributions, retirement date, benefits after retirement, and so on. Further, machine shop management should investigate into the legal, accounting, labor relations, economic, financial, statistical, and other aspects of a pension plan for obvious reasons thereof.

Perhaps, of all the problems facing machine shop management, the subject of pensions is second to no other. Space does not permit complete elaboration of the implications, requirements, and results involved, because such are too numerous. However, while the objectives of the free American enterprise system and unionization are in conflict on many issues, both recognize the need for some kind of a pension plan. Advance planning helps in

many ways.



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The fact that pension plans are a significant issue in managementlabor relations has raised many questions of inquiry by machine shop management. In considering this subject, machine shop management might well study the various excellent textbooks on pension plans, in order to understand their aspects and benefits. After all, machine shops are in competition for productive manpower fundamentally with other economic units. and if they are to maintain the alleged benefits enumerated above, they will want to probe into this subject of pensions.



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For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.



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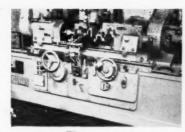
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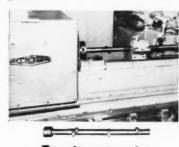
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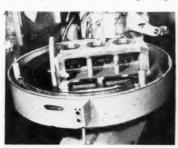


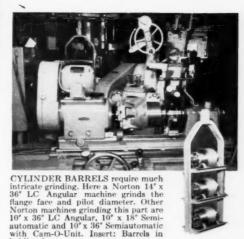


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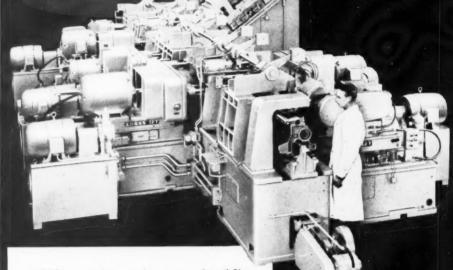


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#### January 19-22

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#### January 26-30

Eleventh International Heating and Ventilating Exposition sponsored by the American Society of Heating and Ventilating Engineers, International Amphitheatre, Chicago, Illinois.

#### March 23-27

Eighth Western Metal Congress and Exposition sponsored by the American Society for Metals, Pan-Pacific Auditorium, Los Angeles, California.

#### June 1-12

Canadian International Trade Fair, Exhibition Park, Toronto, Canada.

#### June 16-19

American Welding Society National Spring Technical Meeting with Welding and Allied Industry Exposition at Shamrock Hotel, Houston, Texas.



## The Push Button Era Has Reached Gaging

By C. W. KENNEDY

The operation and advantages of automatic gages in checking parts are explained in detail.

X7HEN it comes to doing something about checking the dimensional conformance of parts as and after they are made, manufacturers have worked out several alternatives from which to choose. They can: (1) do nothing about it at all and send the parts on without concern for the customer; (2) send parts on to assembly and let assembly operators cull out the rejects: (3) make a first piece or setup inspection and trust the tools to duplicate the rest of the lot; (4) have the operator spot check his worksome system like gaging every tenth piece; (5) assign a patrol inspector to sample check the work at routine intervals; (6) have the discards sorted out of the day's work by a gang of inspectors—100 per cent inspection in other words; (7) use quality control techniques; (8) use a modification of 2, 3, 4, and 5 where the sampled batch is 100 per cent gaged on the spot by the operator and/or an inspector when the spot check indicates too high a proportion of contaminated work; (9) have the operator himself gage each part as it drops from the machine; and (10) use automatic gaging.

Reading the choices above should show that they are listed in order of accomplishment, accuracy, and dependability. Obviously, number one spells commercial suicide. Letting George the assembler do the inspection (number 2 in the list) merely introduces

undue assembly expense, plenty of shop wrangles, and still sends an unsatisfactory product into the field. Spot



Illustration showing example of automatic gaging.

checks of the sort implied in the next few items on the list are liable to be valueless—no more than empty motions—unless they are supplemented by one of the statistical tests applied in quality control. Small samples can mislead two times out of three.

You find manufacturing executives who still naively believe the products are completely screened of all substandard pieces once an inspector has gone over them. (See number 6 in the list above.) The initiated know, however, that 100 per cent inspections, so-called, are not 100 per cent. Give inspectors contaminated work and some of the outsize pieces are bound to slip through their fingers. The countrywide average effectiveness of day in and day out screenings performed by

factory groups is only 85 per cent. Somewhat higher inspection efficiency and better products are obtained from on the spot screenings, as item eight suggests, if the indications from sampling and quality control are conscientiously heeded.

With the exception of automatic gaging for culling outsize pieces from a production run, the greatest protection seems to be gained when the system pointed out in number 9-where the operator himself definitely gages each and every piece as it drops from the machine—is followed. The results have been found especially effective where the operator is equipped with indicating gages, since, with indicators, he can tell when the work is approaching tolerance limits. The operator soon gets to looking after the tools, wheel, or adjustment before he has crossed the line into real trouble. Conventional snap and plug gages only serve notice after he has gone over the line.

Where a machine is designed to make multiple dimension pieces, how-

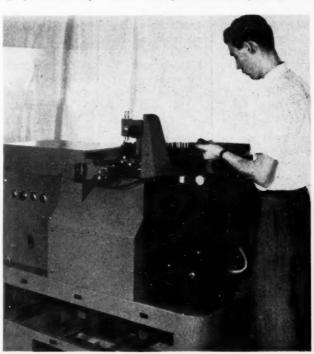


Fig. 1—For efficiency, it may be best to feed parts to the gages by hand, as shown herewith.

ever, the idea of operator sorting sometimes doesn't set too well, especially in high production shops. Often, the machine produces faster than an operator can use a series of conventional gages on all its output, and the inspection and gaging part of the operator's cycle tends to pace the output. Nevertheless, this hindrance has often been overcome by equipping the operator with a single-pass multistation indicating gage, tailor-made for the job.

Where manufacturing or economic conditions just about preclude any other system of roping the mavericks out of the herd - if the pieces must be combed over 100 per cent — the automatic gage tops the list for efficiency and proficiency. It has proved to be the most accurate and dependable method for combing outsize pieces and culls from manufactured parts, achieving a reliability even greater than Ivory Soap's famous 99 44/100 per cent. As you would expect, the push button has entered the gaging field. Handling the work the second and third times for inspections

and bottlenecking production to sort the bad from the good no longer fit the pattern of modern industrial economy. Nothing could be simpler than pouring the parts into a hopper or detouring them from a conveyor and have them come through automatically and accurately sorted.

Any contrivance that helps turn out work faster and more uniformly than human hands has become the goal of the factory engineer and industrial designer. If it is not completely self-sufficient—wholly automatic—then it must operate with a minimum of attendance and adjustment.

The automatic machine is little concerned with drafts, noise, getting to work on time, whether the foreman is paying too much attention to the new blond time-keeper, or with paid vacations. Nor is it susceptible to colds, poison ivy, and fallen arches. It has ready means for adjustment, a mechanism most humans lack. If it fails to do the work right, it can be tinkered into shape without a gripe session in the superintendent's office.

Monotony never stupefies nor blunts

the faculties of the automatic gage. Nor can fatigue exhaust its efficiency. It is as much on the alert at shift's end as at the start. It will keep on ticking off

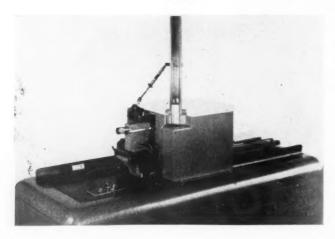


Fig. 2 — Gaging production can be increased by stacking the pieces to be gaged up in a chute in the manner shown in this illustration.

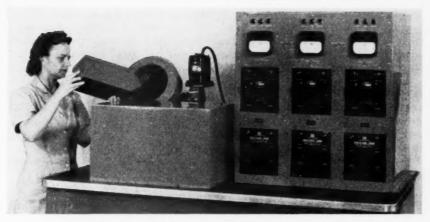


Fig. 3—An hour's supply of gaging is shown being poured into a hopper.

correct measurements through the swing shift and carry on all night, if need be, to the tail end of the grave-yard shift, its decisions being consistently unbiased, accurate, and precise. It will sort and classify to  $\pm$  0.010 inch or to  $\pm$  0.000010 inch without faltering or flinching.

The automatic sorting gage possesses another faculty difficult for human hands and eyes and the human mind to equal-classification. Modern manufacturing technology prescribes pieces specifically sized and selected for assembly, the technique known as selective assembly. Inspectors may train themselves to a reasonably satisfactory proficiency in simply separating the goats from the sheep; but, when you add the task of distributing the parts into six, twelve, or twenty size classes, the inspection results bog down under such a confusion of errors that all the time, trouble, and effort are virtually wasted.

In one fairly major respect, the automatic gage bears a close resemblance to most other so-called automatic machines and apparatus; ways and means have to be designed to handle the parts or material. The solution may be a chute, belt, chain, reciprocating mechanism, dial, hopper, or almost any one of the conventional methods of conveying and presenting the work to the gaging operation piece by piece. In some situations, the best solution to the problem is to hand feed the gage. On one automatic gage which measured, sorted, and classified miniature ball bearings 1/64 inch in diameter, the individual ball was blown by light air pressure through a tube to a feed dial and similarly floated away from the dial to the disposal chute.

The size or type of part often prescribes the handling method. For a dozen reasons, it may happen to be better to feed the parts to the gages one at a time by hand, as shown in Fig. 1, or gaging production can be increased by stacking the pieces up in a chute in the manner shown in Fig. 2. Small parts are more commonly hoppered. Figure 3 shows an hour's

supply of gaging being poured into a hopper. The trend, however, is increasingly toward setting an automatic gage right in the line of travel of the workpieces — which are being moved, say, by belt — to save the kinds of interruptions in flow which usually occur when human hands dip into the process of moving materials. Such a setup is shown in Fig. 4 where there is a connecting track to a belt conveyor at the left end and a chute to

tain an automatic gage should be more than a matter of Smith ordering a gage like Jones bought, with perhaps a small modification to accommodate Smith's product. Smith's methods and shop layout may be totally unlike Jones'. It pays the buyer of an automatic gage to insist that his own engineers work closely with the gage designer for a while until every potential short cut has been explored.

The next step frequently calls into



Fig. 4—The trend is increasingly toward setting an automatic gage right in the line of travel of the workpieces, as indicated by this setup where there is a connecting track to a belt conveyor at the left end and a chute to drop the in-tolerance pieces on a belt at the other end.

drop the in-tolerance pieces on a belt at the other end.

The matter of handling the workpieces from the point of operation to the gaging mechanism, and away from it, is being particularly stressed here for at least two reasons, the second contingent on the first. A substantial portion of the savings an automatic gage might accrue for its owner can easily be drained off through a poor system of transporting and introducing the parts to the gage. In other words, if proper planning is not given with regard to the installation of automatic gaging in the flow of production, bottlenecks are set up or unnecessary handling labor is incurred.

The word "planning" brings up the second reason for emphasizing the attention on handling. Arranging to obplay considerable ingenuity on the part of the gage designer. Each part or piece must be picked up and gaged. What might seem a simple operation for human hands and fingers can mean some tremendously intricate mechanical contrivance. And to go into detail on all the ingenious mechanisms that have been dreamed up for this purpose would fill many volumes; just a hint of their extent can be offered here.

In some designs, the chain or belt system which carries the work to the gage can be continued so that the pieces travel on through the gaging caliper, as shown in Fig. 5. Now the details of design and manufacture are not so simple and obvious as they appear in the illustration. The wrist pins which appear in Fig. 5 are to be meas-



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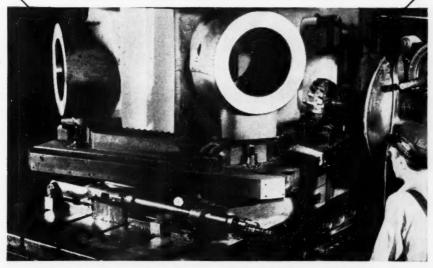
has on his payroll at least one man ured for sorting into categories 10 milthoroughly indoctrinated in the foibles lionths of an inch apart. To gage a of his automatic gages-an education wrist pin diameter in the ordinary a gage setter can get either from the manner by hand under a bench commanufacturer's service representative parator or by mikes and have no error or, better, through a visit to the gage greater than 10 millionths is no mean feat of manual dexterity. What no factory. Mention of a wrist pin sorter might photograph can ever picture are certain "tricks of readily lead to the conception that automatic gages are for close tolerthe trade" the designer ance work only. While they are and gage mechanic know and use to assure errorproof gaging by means of a "machine." Perhaps right here is a good place to interrupt with another suggestion to

Fig. 5—In some designs, the chain or belt system which carries the work to the gage can be continued so that pieces travel on through the gaging caliper, as shown in this view.

the automatic gage buyer. Although it is automatic in action, an automatic gage, like any other gage, is subject to wear, dirt, temperature change, jarring, mishandling, ignorance, and carelessness. Due to causes entirely beyond the control of the designer and maker, an automatic gage may require adjustment if not repairs. Consequently, the buyer should be sure he

capable of handling quantities of close tolerance units more accurately than even an exceptionally proficient force of human inspectors, their prime reason for existence is time saving. In other words, the matter of component tolerances is readily covered by the designer and gagemaker, and automatic gages are made to meet many situations where very broad manufacturing

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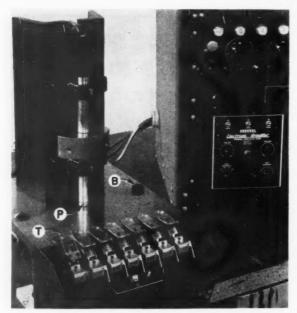


Fig. 6—Semi-automatic gage designed for classifying paper-thin washers for thickness: P—gage plunger; B—operating button; T—Irap door to disposal chute.

tolerances are permitted. As an example, a golf club manufacturer has an automatic gage to sort club shafts. By this means, he not only gets shafts graded for the short golfer and his tall companion, but also secures categories of clubs uniform in weight. The gage also throws out bent and warped shafts. In the broad tolerance field, another manufacturer grades material like wallboard automatically for thickness and width.

Having measured a piece, the automatic gage next disposes of it in the proper place. And here we run into the wizardry of the electronic brain and memory. How the function looks from the outside can best be described perhaps by referring to the semi-automatic gage shown in Fig. 6 which classifies paper thin washers for thickness. The actual measurement of each washer is made by manually pushing it into

location under the gage plunger, **P**, in Fig. 6. The washers are so thin that tiny tweezers have to be used. The operator touches the button, **B**, which causes the electrically operated plunger to descend onto the washer, register the thickness, and retract. At the instant the measurement is made, one of the trap doors, **T**, flies open. The op-

erator then slides the measured washer over into that disposal chute and proceeds to gage the next washer. As the plunger **P** starts down for this next measurement, the trap door which was open now closes. In other words, the cycle is complete; the decks are momentarily cleared.

If the next washer is the same thickness as its predecessor, the same trap door flies open. If it is another size, a different trap opens. Ordinarily, one trap door (usually at one end of the row) is designated for undersize work and another, at the far end, for oversize work. In this manner, scrap is kept separate from rework and both from usable pieces. In the case of the washers, it was more convenient to have them grouped in several size categories for selective assembly purposes, and the five trap doors (Fig. 6) between the undersize and oversize

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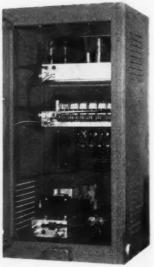


Fig. 7—Front and rear views of dispatcher's station containing electric brain for fully automatic sorting gage.

were provided for this purpose. The important point is, however, insofar as the inspector is concerned, only one door — the proper one — will open at one time. The inspector cannot make an error.

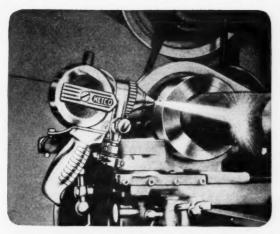
In trying to measure and classify work, inspectors make two kinds of mistakes. The first and most obvious, but the less common, mistake is wrong measurement - either using or reading the gage incorrectly. An automatic gage, when properly set, eliminates this difficulty. Placing each piece after it is measured into the proper receptacle is where most inspectors fall down most often. However, if the gage, as shown in Fig. 6, offers only one opening - the correct receptacle at the correct time - an inspector would have to be unusually wayward to get the measured pieces where they don't belong.

The number of size intervals to be

used brings the buyer and the designer together again, the decision lodging mostly with the former, of course. Many automatic gages drop the undersize work in one till, the oversize work into another till, and all the in-tolerance work automatic-

ally goes down a third chute — simply three categories. A limit of about twenty size intervals is practical for classifying for selective assembly.

As for what might be called the sharpness of size divisions — the width, if you want to say so, at the dividing line between size classifications - the gagemaker should be allowed some five millionths inch (0.000005) leeway. This means, for example, that if one of the classified sizes was decided on at 0.7500 inch, that station would accept work that was larger than 0.7500 inch (up to 0.7501 or 0.751 inch, say, depending on the desired spread of size interval). However, because of the gagemaker's tolerance just mentioned, a piece 0.750005 inch might be thrown into the next lower class, or a piece actually smaller than 0.7500 inch — say, 0.749995 inch might be sent on into the 0.7500-inch plus class.



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In the fully automatic gage, the same result of disposing of the piece at the proper time in the proper place is effected automatically. Looking back at Fig. 5, for one example, you see several wrist pins riding along the belt past a row of chutes. In this gage, a trip device — a "kicker" or "pusher" — comes up under the wrist pin at the right second when it is opposite the size classification chute it belongs in and sends the pin rolling on down that chute. In other designs, the pieces

Eniac that have received so much publicity recently. Figure 7 portrays one of these dispatcher's stations front and back.

Basically, the trick is to have the measurement create an electric impulse by, at, or through the electric gaging head or caliper. Once the impulse is available, it can be stored, de-

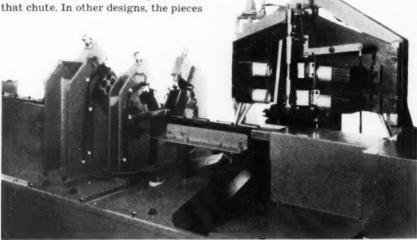


Fig. 8—At this hardness testing station, a wrist pin is automatically "scleroscoped" as it passes by on the way to be measured in an adjoining automatic gage.

leave the gaging head through a common chute or track but are diverted into the proper receptacle farther on through the correct trap door automatically opened by the gage.

To accomplish all this is the function basically of the electric brain, or "memory circuit" as the electronics engineer terms it, assisted by switches, solenoids, and electromechanical devices. This brain resembles the electric mazes we have seen pictured for the huge electronic computers like

layed, amplified, split up, or what have you — used in almost any way necessary to accomplish the automatic handling or disposal action after the measurement is registered.

Looking at Fig. 5 again, you see several wrist pins which, having been measured, are moving along past the rows of chutes. The electronic brain has the faculty of remembering the size of each of these wrist pins and keeps an eye on it, to use an expression, until it has arrived at the pro-



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Comparable to the "JA" Floating Holder, which has thoroughly proven itself in the field, the new "JT" is designed for use in multiple spindle machines. It has double gear spline drive, with clearance between mating splines that allows free movement of floating and driving elements for uniform tapping operations.

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Collet is split on 4 sides; centers tap by the shank, reducing strain and tap damage. Thrust bearings permit cutting tools to float freely into alignment.

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Balls, in the 2 thrust bearings, are free to move or rotate around the collet because they are separated from the drive. This reduces destructive scrubbing action which prevents free float.

#### REDUCES WEAR

Wear of floating elements is practically eliminated, due to positive lubrication of all parts during operation.

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Outer shell with its "O" ring is a perfect seal to retain lubricant and keep out chips and dirt.

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per size interval chute. There, as has been said, it signals the disposal apparatus to nudge the wrist pin into that chute. At the same time, a signal goes back to the electric brain that "operation wrist pin size" has been completed. The memory circuit is cleared; in other words, is ready for another wrist pin. In the meantime, other elements in the memory device of this automatic sorting gage have

been tagging the succeeding wrist pins.

It is usually possible and frequently reasonable to combine other operations with the automatic gaging itself. Most automatic gages are equipped with counters, for instance, at the request of the buyers, so that the user gets a tally of the total production handled by the gage plus subtotals of the pieces in the various categories and scrap and salvage.

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Figure 8 illustrates a hardness testing station which is designed to extend the usefulness of an automatic gage. At this station. each wrist pin is automatically "scleroscoped" as it passes by on the way to be measured. If it fails in hardness. the wrist pin is immediately rejected by automatic action which rolls it down the discard chute shown in front of the scleroscope.

From the economic angle, automatic gages are justified by reports like the following: "The gage keeps up with production from three centerless grinders through which the parts can



If you're using obsolete, slow-poke methods of shearing, the Kling Double Angle Shear can help you save time and money. This modern compact machine is designed for high speed, high production shearing on both long and short run jobs. Many metal fabricating plants and steel warehouses have found the Kling Shear to be the workhorse of the shop. For instance, one machine will shear round bars and bar angles on the left side while the right side can be used for structural angles and flat bars. The machine is built with the speed and power to handle the bulk of your shearing requirements. For shops with considerable mitre shearing

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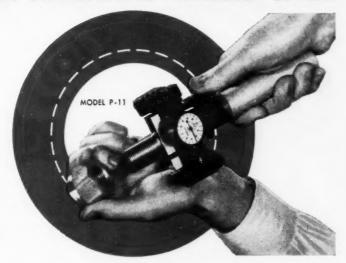
be run continuously because they are measured immediately after grinding. This alone has stepped production up five times over the previous rate. Such increased production plus lower inspection expenses and less scrap has brought the unit cost of the parts down to one-third of what it was. Five inspectors who previously measured and sorted the work have been released for other duties in the production line. The gage operator can change from one size part to another in less than ten minutes."

The use of automatic gages is not confined solely to metal parts. They are already in service on porcelain, glass, sapphire, plastic, mica, and hard rubber products. They sort for o.d., length, thickness, i.d., taper, runout, warp, depth, location, curvature, and angle. What the future holds for such push-button automatons is probably limited only by the boundaries of imagination and ingenuity.



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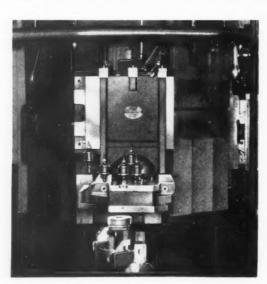
### 4¾-Inch Rocket Threads Rolled with Special Attachment

SALVO Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich., has recently built special thread rolling attachments which are designed to operate on the cross turning slide of the Bullard Mult-Au-Matic, rolling large diameter threads in the normal

cycle time of the machine. Since threading and other machining operations are performed without rechecking, there is no loss of thread alignment, and the need for moving the part from one machine to another is eliminated. As a result, threads are held concentric with faces and shoulders.

One of the special threads being produced in machines equipped with Salvo attachments is a 43%-inch 12-pitch

thread on close tolerance rocket parts. Previous production of the part required a separate threading operation, as well as 100 per cent inspection to assure exact alignment. The huge thread is now quickly and accurately rolled without affecting the Bullard's normal production, thus ensuring a 100 per cent saving in threading labor. Thread surfaces are so uniformly and accurately



Close-view of Bullard Mult-Au-Matic equipped with special thread rolling attachments for producing 4¾-inch threads on close tolerance rocket parts

maintained in high unit production of the rocket part that simple spot inspection is said to suffice.

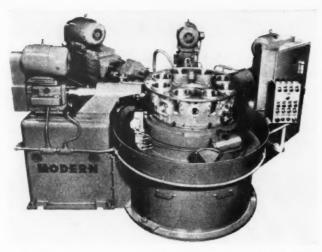
### Machine Drills, Bores, and Faces Aircraft Jet Engine Housings

THE semi-automatic four-way machine illustrated herewith, a development of Modern Industrial En-

gineering Co., 14230 Birwood Ave., Detroit 4. Mich., is designed to drill, bore, and face aircraft. jet engine compressor housings. The machine has four motor-operated heads located at 45-degree positions around the index table. The first head core drills, spotfaces, and countersinks a large hole in one of four identical mounting bosses located at 90-degree positions around the housing. The second head drills four holes in the pad face. The third head of the machine turn-faces the surface of the pad, and the fourth head finish bores the coredrilled hole. Nine 45-degree indexes of the table provide for finishing of all four pads.

Five-horsepower motors power the first and second heads while three-horse-power motors drive the third and fourth heads. Manual indexing has been provided to permit inspection of both the tools and the part between successive precision machining operations. This arrangement avoids possible scrapping of valuable precision





This semi-automatic four-way machine is designed to drill, bore, and face air-craft jet engine compressor housings. Nine manual indexes of the table provide for the finishing of four padded areas on each housing.

fits in one of the flange holes in the housing. The part is held in position by holddown bolts that

are accessible by

rotating the index table, which

parts due to worn or broken tools.

A compressor housing is located on the index table of the machine by one o.d. locating ring and a pin locator that is supported by hardened steel balls. In operation, the index table must be in loading position with the index pin bottomed before the cycle of the ma-

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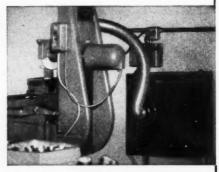
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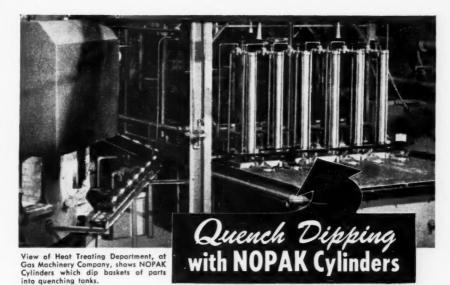
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Nopak Model "D" Cylinder similar to those shown in illustration.

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This installation is typical of the many materialshandling operations in which NOPAK Valves and Cylinders are used. For others see the NOPAK Application Manual.

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chine can be started. Three air cylinders lock the index table down when the index pin is in position. When the cycle button is pushed, the first station is energized, causing the core drilling, spotfacing, and countersinking operations to be performed. A light on the control panel shows when the station is operating correctly. The head on station one recedes automatically after feeding to depth. At the end of its return stroke, the index pin is automatically disengaged and the air cylinder holddowns release, permitting the table to be manually indexed to the next 45-degree position.

The index table can only be indexed in one direction and is designed so that it will not overshoot successive index locations. The four heads are sequenced automatically in their cycle of operations so that the correct head or heads feed at the correct index location. If for any reason the operator wishes to move the work to a position not in the cycle of operations, a manual control is provided so that the table can be rotated and jogged through the index locations without feeding the heads. The four-way machine is about 15 feet long x 51/2 feet high x 8 feet deep. It weighs approximately 23,000 pounds.

# Metal Fabricator Uses Pressure-Sensitive Tape in Welding

TO speed the production of metal tanks and flues, as well as to effect savings by eliminating machine stoppage and repairs of "burn-through" holes, the metal fabricating firm of Farrar Trefts, Inc., Buffalo, N. Y., is now using a burnable pressure-sensi-



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tive tape in its welding operations. Employed for submerged arc welding jobs, the tape—either "Scotch" brand pressure-sensitive tape No. 710 or No. 365 made by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—holds flux in place while the initial "stringer bead" welding of seams on metal tanks and flues is being performed. The tape is being used successfully on metals from ¼ to 3 inches thick.





Welding operator is shown applying pressuresensitive tape to the underside of seam openings of a metal tank prior to welding. The tape, which holds flux in place while initial "stringer bead" welding of seams is performed, burns off as soon as the metal becomes red hot.

Applied to the underside of seam openings, the tape burns off as soon as the metal becomes red hot. The burning, however, does not occur until a secure bond has been made. For welding operations up to 700 amperes, the firm uses the No. 710 tape (acetate backed), while for welds requiring up to 900 amperes, the No. 365 tape (glass cloth backed) is used.



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### Bench-Type Machine Speeds Tub End-Finishing Operations

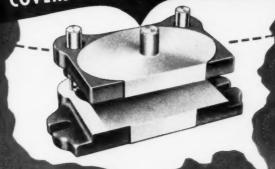
**F**OR many years, it has been common practice for plants to handle pipe and tube deburring, reaming, and facing operations on standard type ma-



Fig. 1—Operator at Turner Brass Works, Sycamore, Ill., is shown end-finishing a piece of welded steel tubing on a standard Pines bench-type machine.

chines such as lathes, or, in some cases, to employ slow hand filing methods. Obviously, for production work, neither method has been satisfactory from the standpoint of efficiency. It is of interest, therefore, to note how Turner Brass Works, Sycamore, Ill., has stepped up efficiency in performing a variety of reaming and inside and outside

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deburring operations on welded steel tubing. With the new standard benchtype end-finishing machine developed by Pines Engineering Co., Inc., 642 Walnut St., Aurora, Ill., and illustrated in Fig. 1, these operations are now completed at speeds approaching special machine output. The savings in time are largely due to the design of the machine, which enables the operator to clamp and feed the work to the

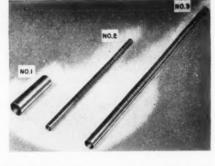


Fig. 2—Three typical workpieces which have been end-finished on the machine shown in Fig. 1. Part No. 1 (% x 0.635 x 4½-inch long welded steel tubing)—One end reamed at a production rate of 880 per hour; Part No. 2 (¼ x 0.049 x 16-inch long welded steel tubing)—Both ends deburred inside and out at a production rate of 700 ends per hour; Part No. 3 (¾ x 0.035 x 32-inch long welded steel tubing)—Both ends reamed at a production rate of 636 ends per hour.



cutting tools with a single forward movement of a hand lever. Since the operator has one hand free, fast stock handling and loading are possible. Workpieces are automatically released by simply reversing the hand lever. For depth of cut, an adjustable swingtype stop operated by the feed rack provides for fast and accurate positioning and gaging.

An idea of the speeds at which endfinishing operations can be performed on the new machine is afforded by the results obtained on the three typical

Pictured: a 24-Spindle Heavy-Duty Drill Head.

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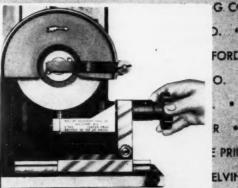
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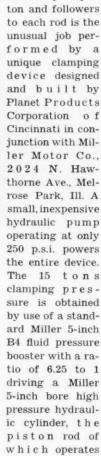
HILLSIDE, N. J.

workpieces shown in Fig. 2. It is significant also to note that the machine is designed so that change-overs from one job to another can be made quickly and easily-usually in one minute. Interchangeable chuck inserts and toolholders for different operations are provided for the machine. The chuck jaws are designed with split-type in-

The machine illustrated in Fig. 1 is constructed to handle stock up to 2 inches in diameter. It is a portable unit, has a 3-speed sheave and ½ h.p. motor, and weighs 170 pounds.

### "Booster" Powered Bench Clamp Develops over 15 Tons of Pressure

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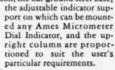


Ames No. 2 Dial Comparator is a compact, stable bench model for measuring nonyielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. Ames No. 2" is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.



Ames No. 13 Dial Comparator features flat-ground, castiron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames

holds any Ames Micrometer Dial Indicator. Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base,

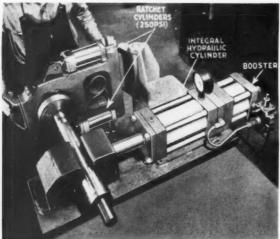




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"Booster" powered clamp used at Planet Products Cor poration, Cincinnati, to hold polished chromeplated steel piston rods firmly at over 15 tons of clamping pressure to permit fast assembly of piston and followers to each rod

draulic cylinders operating at the 250 p.s.i. pump pressure, one mounted at the top and the other at the bottom of the tightening adapter. In the face of this disc are spaced holes for accommodating steel pins that protrude at

right angles to the disc face and lock into tightening holes in the piston follower. With the rod held firmly by the clamp, the piston-follower assembly is placed on the rod lightly by hand. The tightening adapter is then swung into position with the pins in the revolving disc holes locking into aligning holes in the last follower and the entire assembly tightened merely by flicking the switch operating the two small-bore cylinders. If disassembly is required, the switch is flicked to reverse position, thus loosening the follower holding the assembly together.

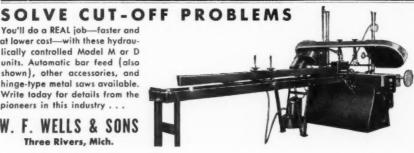
the movable clamping member. The booster and cylinder are assembled integrally as a single compact unit with no high pressure piping used between them. Brass V-jaws on the clamp prevent marring of the polished rod finish under the high pressure developed.

A feature of the device is the tightening adapter for the piston and follower assembly. This adapter is hinged to swing away from or toward the clamped rod and contains a circular tightening disc that turns clockwise or counterclockwise as desired by ratchet action of two small-bore hy-

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### Replacement Drill Jig Solves Production "Bottleneck"

ROCESS men at Morton Machine Works, 2421 Wolcott St., Detroit 20, Mich., recently met a rush demand for a replacement drill jig by using six of the company's standard catalog items, three pieces of cold rolled steel, and a standard replaceable bushing for its construction. The job for which the jig was urgently needed called for a 3-inch hole to be drilled and reamed in a rectangular steel blank. This hole was dimensioned from two sides of the blank within limits of plus or minus 0.005 inch. The rate of production was 120 drilled pieces per hour. The machine used was a Walker-Turner bench drill of 1/2-inch capacity. Tooling and unloading had to be rapidly effected. A single cam (part No. SC-1- equipped with a 1/8-inch dowel for knockout met this requirement. Utilization of two

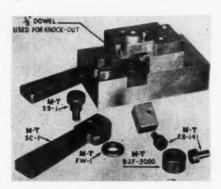


Illustration showing replacement drill jig designed and built by Morton process men to meet the urgent demand for equipment to be used in drilling and reaming 3/16-inch holes in rectangular steel blanks

rest buttons (RB-141) and one button jig foot (BJF-5000) answered the need for hardened and ground wear and locating surfaces. The time required for designing and building the replacement jig was less than eight hours.



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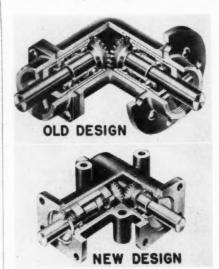
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Steel Type

NUMBERALL STAMP & TOOL CO. HUGUENOT PARK STATEN ISLAND 12, N. Y.

### Right-Angle Gear Utilizes Retaining Rings to Solve Fastening Problem

In redesigning its ANGLgear, Airborne Accessories, Hillside, N. J., used three Waldes Truarc retaining rings, made by Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y., to replace eight screws and



Cutaway view of old and new design of ANGLgear. The new design utilizes three Waldes Truarc retaining rings to replace eight screws and washers and eliminates a sleeve type spacer.

washers and eliminate a sleeve type spacer. The original design utilized two threaded nuts to lock bearings in place and eight screws and washers to position bearing and shaft assemblies. The Truarc inverted retaining rings now employed provide uniform shoulders for locking the bearings in place and positioning the bearing and shaft assemblies. An additional standard Truarc ring is used to locate the

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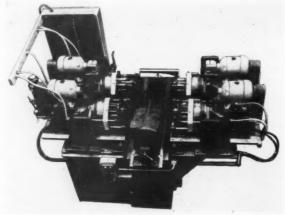
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ball bearing. The retaining rings accommodate all thrust load from the bevel gear assembly in the ANGLgear.

According to the manufacturer, the change in design of the ANGLgear makes it adaptable to many different assemblies, increases load capacity, reduces weight by nearly 16 per cent, and eliminates machining of threads.

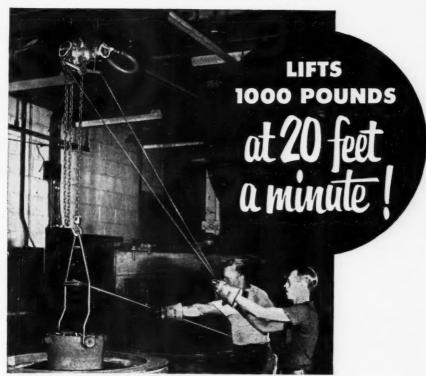
Equipment Automatically Drills and Taps Transmission Cases

**B**UILT by Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio, the special two-station drilling and tapping machine shown herewith is used to drill and tap six power take-off holes on each side of seven different transmission cases. The hole pattern to be drilled and tapped is essen-

tially the same on all cases, but the relative positions of the hole patterns are different. Therefore, the machine is designed with angular, side, and vertical adjustments to accommodate the differences in the positions of the holes in several transmission cases.

The machine consists of four hydraulic feeding units and four gearless drill heads. The first station has two opposed drill heads which drill six holes each in both sides of the case. A transfer unit moves the case after drilling to the tapping station. Upon completion of the tapping operation, the transfer unit returns the work to unload position. The cycle is completely automatic.





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### ideas from readers

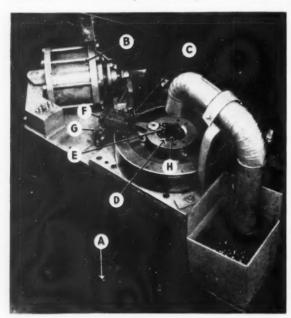
### Simple Air-Operated Device Lances and Pierces 1,000 Steel Cones Per Hour

By IRA S. ROBERTS

A IR-OPERATED equipment is relatively simple in design and yet so flexible as to be ideally suited to specialized equipment design or setup. A number of human motions can be easily resolved into a series of interconnected straight line machine motions activated by an air-power source. Human effort is thereby reduced, time saved, and production costs cut.

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seen on the production floor of the Barth Stamping and Machine Works, Incorporated of Cleveland, Ohio. The problem facing Barth engineers revolved around the small steel



When operator depresses foot pedal A, double-acting air cylinder B moves ring C to right. Simultaneous to ring movement, punches D advance and hold-down arm E swings over workpiece. At the time the punches complete their stroke, fixed cam on the overhang F trips a valve (not shown) which reverses air to cylinder. As ring returns to original position, overhang strikes valve G which causes blast of air to shoot up through die center **H** and carry workpiece through pipe section into box.

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HARDWARE . TOOLS . ELECTRIC TOOLS . STEEL STRAPPING . "thimble-like" cup shown in the accompanying illustration. This cup, or cone for a better word, required lancing at three points spaced at 120 degrees on the large diameter and also required one hole to be pierced near the top. Because the item had to be mass produced, Barth sought a quick way to do the job. The solution is the machine shown in the illustration.

Essentially, the design consists of

WITH

an air cylinder linked to a ring. Within the ring are three lancing linkages. One of these linkages also holds the piercing punch. Mounted across the ring is a simple arm whose movement is governed by a slot in the heavier plate screwed to the ring. This arm serves to hold down the workpiece and assure uniformity. The slotted plate also carries a fixed cam which trips in sequence the air valves directly be-

neath the plate overhang.

### Operation of the machine is as follows: The operator places the workpiece on the die H and then steps on the foot pedal A. Air enters the doubleacting cylinder B whose stroke is then to the right. The ring C, which is linked to the piston, moves clockwise actuating the linkages D which advance all punches simultaneously. The hold-down E is also swung over the workpiece. At the time the punches complete their stroke, the cam on the overhang F strikes the air valve (not visible), which reverses the air to the cylinder. As the ring returns

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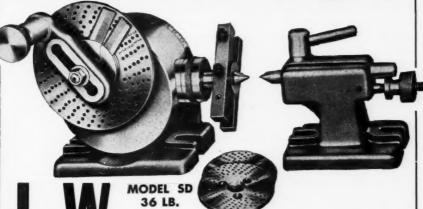
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to the starting point, the overhang strikes the other air valve **G** which causes a blast of air to come up through the center of the die and shoot the workpiece into the box via the pipe section. During the entire cycle the operator is free to pick up his next piece and prepare to place it on the die.

This air-operated machine enables the worker to turn out 1000 pieces per hour. Air is supplied to the machine from Barth's stationary compressors which also supply many other air devices in the plant.

### Quick-Acting Holding Fixture for Button and Vee-Head Screws

By W. M. HALLIDAY England

ECENTLY, the writer was confronted with the task of extending the threaded portion of the shank of a standard fis-inch button head screw, as shown at A in Fig. 1 of the accompanying sketch. Some of these screws had to be machined to extend the thread an additional 1/4 inch along the shank. A lathe or conventional threading machine was not available for the job, and the screws were bright nickel plated, making it inadvisable to hold them in a bench vise for fear of marring the plated surfaces. Therefore, we devised the simple holding fixture shown in the sketch which enabled the rethreading operation to be performed economically and without inflicting any damage to the polished heads.

The fixture includes a standard square or hexagon headed steel bolt, **B**, having a shank diameter approxi-



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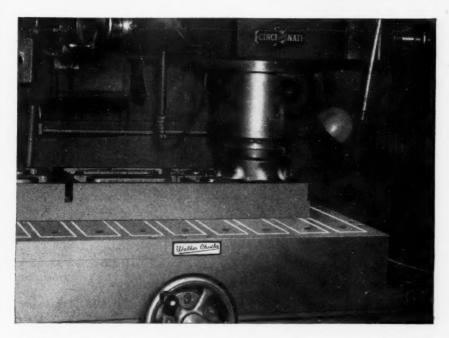
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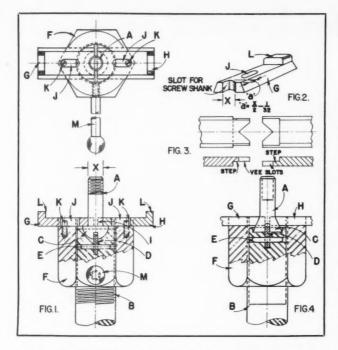
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Sketch of quick-acting holding fixture for button and vee-head screws

inch less than the height of the button head so that the square face on the underside of the head projects from the concave recess as shown. A narrow slot is cut diametrically through the end of the bolt B, the slot being machined well down the shank below the concave recess C, and is fitted with a hardened and tempered cast

steel tongue piece, **D**, which is retained permanently in position by a small diameter cross pin, **E**. The upper portion of the tongue is chamfered and extends through the concave recess **C** for a certain distance so as to readily engage the screw driver slot provided in the button head of the screw **A**.

A standard hexagon nut, F, is fitted

mately 1½ times the maximum diameter of the button head on the screw A. The bolt is provided with a semispherical concave recess C, formed concentrically on the end face of the threaded shank. The radius of this concave recess conforms exactly to that of the button head of the screw A; however, the depth is made approximately

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ESTABLISHED 1883

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over the bolt B, and across the end race of this nut a dovetail slot is machined exactly central with the bore. Two mild steel hardened slides, G and H. identical in size and shape, are inserted, in a close-sliding fit, in the dovetail slot in the nut F. The inner end face of each slide is machined with a partial circular slot, I, as clearly shown in Fig. 2 of the accompanying sketch. The purpose of these slots is to embrace the plain shank of the screw A and to permit the base surface of each slide to bear lightly against the square face on the underside of the screw head. To prevent the slides G and H from being withdrawn completely from the nut F in an outward direction, an elongated slot, J, is machined fully through each slide at a certain point along its length. A stud. K, threaded firmly into a tapped hole in the nut F, extends into the elongated slot in each slide to arrest the

outward movement of the slide. At the end opposite to the slot I. each slide is machined with an integral raised step. L, the purpose of which is to provide easy fingergripping facilities for operating the slides backward and forward within the nut. A ball handle, M, is threaded into one flat side of the hexagon nut F for adjusting same.

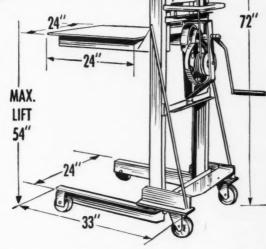
To use the holding fixture, the nut F is unscrewed a full turn on the bolt B and the slides G and H are retracted by hand so as to permit easy access to the concave recess C. The screw to be rethreaded is then inserted head first



# Cut accidents Increase man hour production

with a . . .

Handles heavy dies from storage rack to press. Lifts barrels, boxes, loads trucks, makes a handy adjustable shop table. Automatic brake holds load at any height.



Type	D -Hand operated CAP. 500 lbs\$183.60
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ECONOMY ENGINEERING CO.

4507 W. Lake St., Chicago 24, III.

in the recess C in such a manner that the screw driver slot engages the tongue D. The slides G and H are now moved inward to embrace the screw shank immediately underneath the head. Lightly holding the slides in their innermost position, the nut F is screwed further onto the bolt B by means of the handle M until the screw head is firmly locked between the slides and end of the bolt, the opposite end of the

bolt being clamped by its square head in the jaws of a bench vise. In this manner, the screw is held firmly and accurately for performing the desired threading or similar operation on the shank.

To release the screw, the nut **F** is loosened slightly and the slides **G** and **H** moved outward away from the shank of the screw, whereupon the latter may be lifted out of the fixture.

While this fixture is designed primarily for holding on e particular size of button head screw, a simple modification will permit various shank diameters to be accommodated. Such modifications, applied solely to the slides G and H, are clearly shown at Fig. 3 in the sketch. Instead of providing each slide with a partial circular slot. I, at the gripping end, a 90-degree V-slot is employed. The slotted end portion of each slide is then stepped down to half thickness on opposite sides as shown so that these portions can overlap when a small diameter screw shank is being gripped.





"HARD TO FIND TOOLS FOR STOCK DELIVERY

# Why Wait for SPECIAL TAPS? We have them in STOCK for IMMEDIATE DELIVERY

HIGH SPEED

SPECIAL

RIGHT HAND TAPS



SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
4	32-48-60-64	7/16	12-16-18-22-24-27-28-	1-9/16	18-20-24
5	30-32-36-48-80	1	30-32-36-40	1-5/8	51/2-8-10-12-13-16-18-
6	36-40-48-56-60	1/2	12-14-16-18-22-24-26-		20-24
7	32-40		27-28-30-32-40	1-11/16	
8	24-30-36-38-40-44-48	9/16	16-20-24-27-28-30-32-	1-3/4	8-10-12-14-16-18-20-24
9	24-28-32-40	1 - /0	40-48	1-13/16	8-10-12-14-16-18-20
10	28-30-36-40-48-64	5/8	12-14-16-20-24-27-28- 32-36-40	1-7/8	8-10-12-14-16-18-20-24
12	20-28-32-36	11/16	11-16-18-20-24-27-28-	1-15/16	8-10-12-14-16-18-20-24
14		11710	30-32		28
	20-24-28	3/4	9-11-12-14-18-20-24-	2	41/2-8-10-12-16-18-20
1/16	60-64	1 "	26-27-28-32	2-1/16	12-14
5/64	72	13/16	10-14-18-20-32	2-1/8	12-16-20
3/32	48	7/8	10-12-16-18-20-24-27-	2-3/16	12-16
7/64	48-56		28-32	2-1/4	41/2-8-12-14-16-18
1/8	32-40	15/16	8-9-10-12-14-16-18-	2-5/16	12-18
5/32	32-36-40		20-24-32	2-3/8	12-16-18
9/64	36-40	1	10-12-16-18-20-24-27-	2-1/2	8-10-12 18
3/16	36 20-24-32		32-40	2-9/16 2-5/8	12-16-20
13/64	32	1-1/16	12-14-16-18-20-24 8-10-14-16-18-20-24-32	2-3/4	16
7/32	24-28-32	1-3/16	8-10-14-16-18-20-24-32	2-7/8	8-12-16
1/4	18-24-26-27-30-32-	1-1/4	8-10-14-16-18-20-24-32	3	8-16
., -	36-40	1-5/16	12-14-16-18-20-24-32	3-1/4	8-12-16
5/16	16-20-22-27-28-32-40	1-3/8	8-10-14-16-18-20-24	3-1/2	8-12-16
3/8	12-16-18-20-27-28-32-	1-7/16	8-10-12-16-18-20-24	3-7/8	6
	36-40-48	1-1/2	8-10-14-16-18-20-24-28	4	8-12

#### HIGH SPEED LEFT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
0	80	3/8	16-24-32	1-3/8	6-8-10-12-16-18-20-24
1	56-64-72	7/16	14-20-28	1-7/16	8-10-12-14-16-18-20
2	56-64	1/2	12-13-20-28	1-1/2	6-8-10-12-16-18-20
3	56	9/16	12-18-20-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-18-20-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-16-18-20		
8	32-36-40	13/16	16	1-3/4	8-10-12-14-16-18-20
10	24-30-32-40	17/8	9-12-14-18-20	1-13/16	8-10-12-14-16-18-20
12	24-28-32	1	8-12-14-16-18-20	1-7/8	8-10-12-14-16-18-20
1/4	20-28-32	1-1/8	7-12	1-15/16	8-10-12-14-16-18-20
5/16	18-20-24-28-32	1-1/4	7-12-16-18	2	41/2-10-12

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Prices on Application—We are always adding new sizes NOTE: Oversize—Undersize—Acme—Metric—64th— 32nd Size Taps Available for Quick Delivery.

SID TOOL COMPANY, INC. CUTTING TOOL SPECIALISTS 126 LAFAYETTE STREET . NEW YORK 13. N. Y.



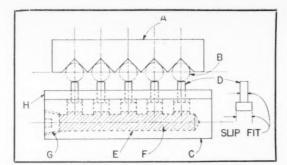


Figure 4 shows another simple modification which can be made in the fixture design to allow for the accommodation of vee-head screws. This modification consists of providing a shallow flat bottom recess, C, in the end of the bolt B in place of the concave recess as used in Fig. 1. The two slides G and H are provided with partial conical slots on the gripping ends, the sides of the slots being inclined to suit the angle of taper on the screw head.

### Equalizing Jaws for Milling Fixture

By CLIFF BOSSMANN

OCCASIONALLY in machine shop practice, an order is received that calls for the milling of round stock. Sketch of equalizing jaws for milling fixture

The diameter of such stock usually varies to a certain extent and, in order to efficiently mill more than one piece of stock at a time, an equalizing type of fix-

ture would have to be employed. The accompanying sketch shows a design of jaws which might be used in making a fixture of this type.

The stationary jaw A is provided with a series of V-grooves in which the round workpieces B are loaded. The movable jaw C contains five plungers, D, and a long drilled hole, E. After the plungers have been inserted in their respective holes, the drilled hole E is filled with beeswax, as shown at F. A pipe plug, G, is then screwed into the end of the hole E, and the jaws are ready for use. The beeswax effects an equalizing action on the plungers D so that if there is any variance in part diameters, each part will be held with the same clamping pressure. The plungers are retained by the plate H.



# "—and they chopped down the Old Pine Tree."

## Woodsmen Use Marking Devices!

When a forester indicates a tree is to be cut by the lumberjack he usually paints a mark just above the ground and another about breast-high, indicating it is to be cut for lumber purposes. If the tree is diseased he usually marks it with an X or other suitable device, indicating that it is to be cut for destruction or firewood.



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CADILLAC Heavy Bevel
Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life.

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The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring especially long life. All CADILLAC Marking Type and the recess in Type Holders are made in standardized dimensions. This means that type will fit interchangeably in hand holders, A system of distinctive marking machine holders or punch press holders designed symbols for inspection for the size type specified. Due to the precision adhered to ings. Write for Symbol in manufacturing, they will when assembled in any holder make impressions in perfect alignment.



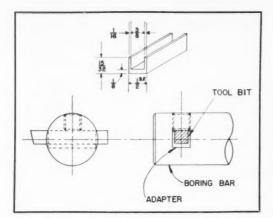
SYMBOLS



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3000 IRVING PARK . CHICAGO 18, ILLINOIS





Boring Bar Adapters Permit Use of Smaller Bits

By IRWIN MANSFIELD

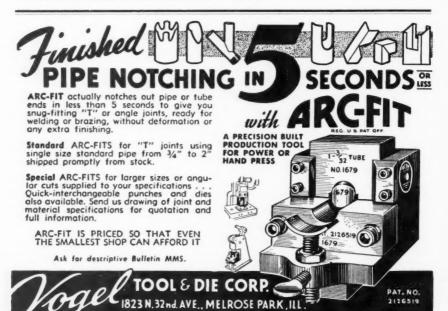
SOMETIMES it is necessary or desirous to use a tool bit of a smaller

Sketch of simple boring bar adapter

size than is ordinarily accommodated by a boring bar. By making an adapter similar to the one shown in the accompanying sketch, it is possible to use, for example, a \%-inch square bit in a ½-inch hole of a boring bar. The adapter consists of a square piece of cold rolled steel which is machined into the shape of a channel and is slipped into the hole

provided in the boring bar.

By making up several adapters of different sizes, the versatility of boring bars can be greatly increased, especially when the size bit desired is not at hand.





# Speed! More Speed! Stree Call-

AND THESE MODERN POWER-DRIVEN ASSEMBLING MACHINES WILL DO THE JOB FOR YOU AT A REMARKABLE TIME AND LABOR-SAVING PACE

The D.P.S. line of Power Screwdrivers, Motorized Hoppers, Nut Drivers and other power-driven equipment has proved an absolute necessity in the present-day program of production assembling. In replacing slow, expensive hand methods in thousands of plants, they are now intrenched as an indispensable aid in meeting urgent calendar requirements— WRITE US, send sample assembly, receive our catalog, and we shall gladly offer suggestions so that you, too, may profit by the use of D.P.S. equipment.

## POWER SCREWDRIVERS

DRIVE SCREWS AS FAST AS ONE A SECOND

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6 sizes, 8", 10", 12", 16", 24" and 30" diameters



Model B

#### Scrap Pipe Makes Excellent Drill Rod Holder

By JOHN ROGERS

THE accompanying sketch shows how short ends of pipe or scrap can be easily and efficiently used to make a drill rod holder for the toolroom or small shop. Since drill rod is normally purchased in 3-foot lengths, the height of the particular holder

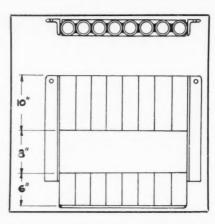


Ever notice how difficult it is in the average catalog—to find EXACTLY the right kind of hand or machine marking device?

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NEW METHOD STEEL STAMPS, Inc. 149 Joseph Campau, Detroit 7, U.S.A.



Sketch of drill rod holder made from scrap pipe

shown was made 24 inches. However, to permit the storing of short or leftover pieces of drill rod, the holder is designed in two sections, the lower section being but 6 inches high.

To make a holder of this type, the pieces of pipe comprising each of the two sections of the holder are welded together and the bottom of the lower section is covered with a piece of flat sheet metal. The top section is then connected to the bottom section by means of two pieces of angle iron having holes drilled through them which permit the drill rod holder to be readily hung in the location desired.



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N.C. In all S.A.E. sizes



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# Boley No. 4 PRECISION LATHES

# **Three Types for Production or Tool Room**

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4E Lathe has headstock with hand wheel collet attachment, crank-type tailstock and cross slide.

#### FOR PRODUCTION RUNS

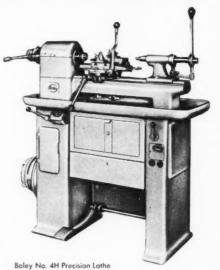
4H Lathe has headstock with lever operated collet attachment, tailstock and cross slide.

4PS Short Bed Lathe has headstock with lever operated collet attachment and cross slide.

#### SPECIFICATIONS

Swing-10", Distance between centers for 4E and 4H-18", Collet capacity-34", Spindle speeds-6, 9, 12, 18 up to 3750 rpm. Powered by flange type motor with 2 or 3 speeds to three step pulley in headstock—Slides and tailstocks are interchangeable on all models.

Built to maintain toolroom accuracy on the production line, Boley No. 4 PRECISION LATHES have spindle speeds up to 3750 rpm. They are versatile, easy to operate, have multiple tool holders for cross slide and tailstock, adjustable stops to limit tool travel, lever for rapid chucking of workpiece while machine is running and rapid stopping of work spindle.



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#### OTHER BOLEY PRECISION MACHINE TOOLS

1, 2, 3 Precision Lathes—4", 5" or 7" swing. Maximum spindle speeds from 3750 to 6,000 rpm.

4-L Lead Screw Lathe—for cutting 4 to 80 threads per inch and precision turning. 10" swing. 12 or 18 spindle speeds up to 1900 rpm.

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REV Turret Lathe—for intricate turning and thread cutting. 1" or 1-5/8" bar capacity. 6 to 8 turret tool holders. Spindle speeds from 300 to 2500 rpm.

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IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couxens Highway, Detroit 35, Mich.

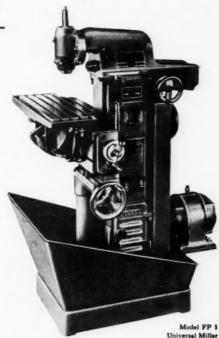
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Basic features of the FP 1 include heavy column, adjustable guide ways and spindles, large graduated scales, high precision measuring equipment, convenient location of operating controls, directional single lever control of automatic table feeds and ample power for removing metal at a high rate.





Other Deckel Machines for Tooling and Production 2 DIMENSIONAL ENGRAVERS 3 DIMENSIONAL ENGRAVERS UNIVERSAL PANTOGRAPH DIE SINKERS UNIVERSAL TOOL & CUTTER GRINDERS

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#### Monarch Completes Large Expansion and Modernization Program

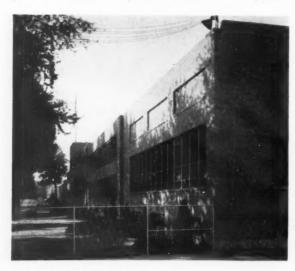
Knowing that modern armed conflicts are won or lost by the quantity of machine tools available to the combatants, management of The Monarch Machine Tool Co., Sidney, Ohio, broke ground for long-planned addition to manufacturing space just 60 days after the first shot was fired in Korea. Completion of this first expansion was im-

mediately followed by another and even larger one which, with its completion recently, gives Monarch a modern building of 308,000 square feet area, housing the most modern of production facilities for the manufacture of engine lathes, toolroom lathes, a new right-angle lathe, and lathe accessories of the latest design.

The new layout features unidirectional flow of materials through much new production equipment; redepart-

mentalization; a b u n-dant materials handling equipment; a n d adequate heat, light, and service facilities. Monarch is operating on a three-shift operation, which has been in effect since early in 1951.

In 1942, the production area of the Monarch plant contained



View of front of Monarch plant which, with newly completed addition, extends a distance of 930 feet. At wide est part, plant is 386 feet wide.



# Carbide Tool Grinder for precision work

The ½ hp motor that powers this Baldor Carbide Tool Grinder has no commutator, no centrifugal switch, no brushes—a really trouble-free motor that will not burn out even when overloaded repeatedly. Electronically balanced within 1/50 ounce of perfection, the armature rotates at 3400 RPM without vibration—an engineering achievement that makes true precision work possible. First-grade wheels are re-balanced at our plant. Complete price, as shown, . . . . . . . . . \$142.60

Clip this ad and mail for bulletins on Carbide Tool Grinder shown above and complete line of 6" - 12" general purpose bench and pedestal grinders.

Baldor

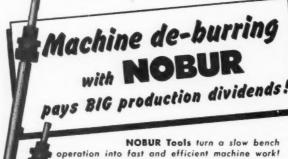
BALDOR ELECTRIC COMPANY 4353 Duncan Avenue • St. Louis 10, Missouri approximately 212,000 square feet. This was a far cry from the 9,960 square feet in which the company started operations in 1909. The two-stage post-Korean expansion has added 43 per cent to the floor space and, during the same period, 25 per cent of the then existent plant and facilities has been modernized.

The most recent additions to the south and west became imperative

when, on top of a backlog of orders already the largest in the company's history, Monarch in September 1951 received a pool order to build several hundred tracer-controlled right-angle (T) lathes of a new design for the fast, accurate machining of jet engine rings and discs. The new construction at the south was a relatively straightforward job of erecting walls and roof over ground not previously incorporated in

the plant's production area. It was work which could and did proceed without any shutdown or interruption in the plant's usual manufacturing operations.

The changes which had to be made along the west side of the plant were of a different order and dictated by the much greater size and weight of the new rightangle lathes to be built there as compared to the size and weight of the other types of Monarch lathes in regular production. Floors and columns of this section of the plant had to be greatly strengthened and the existing roof raised to the high bay level before the



NOBUR Tools turn a slow bench operation into fast and efficient machine work! Remove burrs on multi-walled parts with a smooth, clean cutting action that won't mar highly finished surfaces. Eliminate rejects from slow, costly hand work with files, scrapers and abrasives.

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# 5 times 12 equal 180

Five men handling 12 stations, turn out 180 vital parts per hour at The Falls Stamping and Welding Co., Cuyahoga Falls, Ohio. According to John J. Lange, Falls Stamping executive, "We purchased this new 900 ton Cleveland double crank press to speed production for the defense program. We chose a Cleveland, for this, our largest press, because we have had such satisfactory service from our previous 7 Clevelands. Installed in April of this year, this press has been in operation steadily . . . has exceeded our performance expectations. In that period there has been no noticeable die-wear. The Cleveland Drum Type Friction Clutch and Brake has given us the control and speed necessary to obtain excellent production and yet safeguard the operators.

For outstanding press production make your next press a Cleveland! Let an experienced Cleveland engineer recommend the exact Cleveland best suited to your requirements. Write or call today!



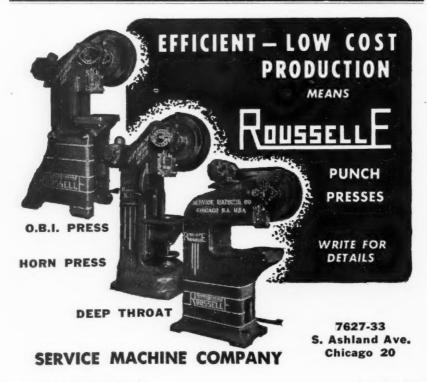
area could be equipped with the necessary facilities for handling the production and assembly of new lathes.

There was also the question of maintaining uninterrupted production in adjoining bays and avoiding so far as possible the making of even temporary layoffs of any of the plant's working force. As a consequence, an unusual method of erection was used for the expansion and modernization of this west side of the Monarch plant. A steel shell was thrown up over the sawtooth roofs of seven existing bays. This shell was constructed with a ceiling height corresponding to that of the high bay of the main building structure, and the last stages of its completion timed to

coincide with the regular two-week plant vacation shutdown of early summer during which the last vestiges of the former structure could be removed, the old production machinery relocated, and the necessary new equipment added. Some 350 machines, of which 77 are new, were involved in this operation which was successfully carried out as scheduled.

#### Demonstrator Display of Magnetic Base Units and Accessories

Cullen Mfg. Co., 1318 Clark St., Racine 1, Wis., is now furnishing mill supply and hardware dealers with a wooden, flock-lined display chest of the



Show your

# ALCO

HOLLOW MILL HOLDER

Here is a tested and proven improvement in hollow mill holders over old fashioned types. You're interested in saving time these days; here's how the ALCO Hollow Mill Holder will do it . . . . Only one wrench is necessary to tighten the nut which holds the hollow mills. Position the mills on the work and tighten the studs on the flange of the holder and you are in absolute concentricity.

Better work . . . . complete finish in one operation comparable with box tool turning.

Longer life . . . . patented internal bearings ground entirely true with the shank bring the hollow mills to exact position so they cut on all lands assuring longer life to your tools.

WRITE FOR COMPLETE CATALOG.



# ALCCFFTOOLS

THE ALCO TOOL CO. 52 BIRDSEYE STREET, BRIDGEPORT, CONN.

Erick Magna-Holder line of magnetic base units and accessories. The chest has a metal plate on the lid which permits demonstration of the units at the point of sale.

The chest contains the Model 100B indicator holder, the Model 200B indicator holder with precision adjustment similar to a surface gage, and the Model 300 indicator holder for use with the larger test indicators as an accu-



Division of Thomson Industries, Inc.

1034 N. PLUM STREET, LANCASTER, PA



Demonstrator display chest of Erick Magna-Holder magnetic base units and accessories

rate lathe stop. All of these models have 50-lb. pull permanent Annico magnetic bases. Other magnetic base units with the same bases include the Model 600 inspection light complete with a 25-watt bulb for use wherever concentrated light is required, and the Model 700 for use in holding flashlights or drop cord lights.

Accessories in the chest that can be used with either the Model 100B or 200B consist of the Model 400 (5 x 7 inches) and the Model 500 (8 x 10 inches) 1/8-inch thick Plexiglass safety



266

## **GAMMONS WELDERS' SEATING REAMERS**

for replaceable Welding Tips Duplex Design . End Cutting Stocked in 4 Sizes

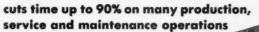
GIVES PERFECT SEAT FOR NEW TIPS Manufacturers of helical taper pins, chucking, die makers, and

MANCHESTER 2.

special reamers. GAMMONS HOAGLUND CO. CONN.



Amazing New Time Saver





Sleek, powerful, compact — this new No. 555 is the most remarkable, most versatile electric tool ever developed. When torque resistance is low, it drives continuously at 1900 r.p.m. Then, automatically shifts to impact action. 2000 powerful blows per minute exert up to 100 ft. lbs. torque — ample to handle threaded parts as large as 5/8" diameter under favorable conditions. Weighs only 63/4 lbs. Rugged and easy to use. Quickly reversible. Write for full information, or better yet, let us arrange a demonstration.

MILLERS FALLS COMPANY, Greenfield, Mass.



SEND FOR BULLETIN 564



The Mark of Superiority

- Runs, sets, loosens and removes nuts and studs
- Taps and threads
- Extracts broken studs and bolts
- Drives screws
- Drills, reams, drives hole saws



shields, and a fine precision-ground double-lens four-power Model 800 magnifying glass.

#### Rules and Conditions for Sixth Annual Engineering Undergraduate Award Program

The rules and conditions for the sixth annual competition of the Engineering Undergraduate Award Program have been released by the James F. Lincoln Arc Welding Foundation. The rules for this year's competition have been changed in a number of important respects.

This year, the 46 awards to be made will be for the best designs of a machine, machine component, structure or structural part that has been designed for welded construction. Duplicate awards will be made for the best entries in both mechanical and structural design. Additionally, three grand

awards will be made to the best of the program designs. To permit participation in the program within the restriction of time available in the normal cirriculum, all entries will be limited to no more than 20 pages. Undergraduates will also be permitted to complete their entry for the program after graduation.

The rules and conditions booklet is now available from the James F. Lincoln Arc Welding Foundation. Cleveland 17. Ohio. This booklet includes suggestions for subject matter, a bibliography, and previous award titles illustrated with drawings.

# **Drill Hardened Steels**without Annealing –



With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It— With "HARDSTEEL"

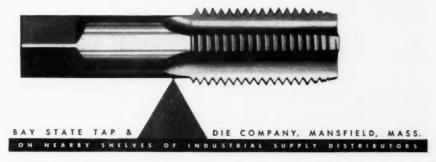
BLACK DRILL COMPANY, INC. 1372 East 222nd St. • Cleveland 17, Ohio Also makers of — BLACK DRILLING UNITS — AUTOMATIC, SELF-CONTAINED — FOR COST-CUTTING PRODUCTION ON ALL MATERIALS

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\_\_\_\_The perfect balance of precision and performance\_



December, 1952

MODERN MACHINE SHOP

269

#### Compressed Air & Gas Institute Receives A.T.A.E. Award of Merit

The highly honored Award of Merit has been presented to the Compressed Air & Gas Institute in the 1952 A.T.A.E. Awards for Distinguished Service sponsored by American Trade Association Executives of Washington, D. C. The Institute was given the award

for its "excellent services to its industry and especially for its education program centered on the schools of engineering throughout the U. S. and on the trade and technical press."

The Institute's award-winning public relations program was launched in 1941 and has consisted of approximately 50 case-history articles published annually in leading trade journals; the

publication of "Compressed Air Handbook" in 1947; and a series of engineering teaching aids, consisting of films, lectures, reference pamphlets, and surveys.

The judges who selected the compressed air power program for the award were the Honorable Charles Sawyer, Secretary of Commerce of the United States, chairman: William J. Grede, president, National Association of Manufacturers: Dechard A. Hulcy, president, Chamber of Commerce of the United States: Edward H. Stromberg. Northwestern University; and Dr. Ray B. Westerfield, Yale University.



PROBLEM: MILL 231/2" x 21/4" SUR-FACE OF TANK CARRIER!

The material – the toughest armor plate casting yet devised for military purposes! An impossible operation with other types of cutters tested.

SOLUTION: STOCK REMOVAL %" to 1/2" IN 3 CUTS -

Finished surface parallel within .002 - NO REJECTS! A smooth machine like finish at  $10\frac{1}{2}$ " per minute.

## HERE'S THE NELCO TOOL THAT SOLVED THIS VITAL DEFENSE BOTTLE NECK!

The rugged virtually indestructible NELCO Taper Shank End Mill – A 4" carbide tipped cutter that literally chews away half an inch of the toughest alloy Armor Plate America has produced – leaving a smooth, accurate machine-like finish.

Write for catalog and complete details on this husky NELCO TAPER SHANK END MILL and the hundreds of other NELCO Engineered Carbide Tools – TODAY!



For that Extra Edge in Production

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT



# Precision Vernier Calipers



A tool to comply with the most exacting demands. Made by the leading European precision tool craftsmen. Measures inside, outside, thread and depth.

The following models have the famous M-Z-B cam lock which guarantees fixed and never shifting setting when pressure on lock is released.

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			01" and 1/128"\$14.00	
N	o. 30-64	Chrome Steel	01" and 1/20 mm\$14.00	
N	o. 30-62	Stainless Steel	)1" and 1/128"\$16.50	
N	o. 30-65	Stainless Steel	01" and 1/20 mm\$16.50	

12" Calipers and Height Gauges also available. Leather cases supplied free of charge with each caliper.

In stock: M-Z-B Micrometers, 1", size to read .0001".

A very fine tool comparable only to the best, \$15.00

We are interested in representatives in various territories, regarding an agency or dealership for M-Z-B fine measuring tools. FOR INFORMATION CONTACT:

# INTER-CONTINENTAL TRADING CORP.

# Commander TAPPER

- Wider Range . . . 1 Tapper Handles No. 0 to <sup>3</sup>/<sub>4</sub>" Taps
- Automatic Tap Protection
- Furnished to fit any Drill Press

Commander — "The Tapper That Thinks For Its Operator," has the adjustable full range torque control that instantly stops any tap when it becomes dull, loaded, strikes a hard spot or bottoms in blind hole tapping. Assures maximum tap protection, higher production, even with inexperienced operators.

Your nearby Commander Distributor can give you a demonstration in your own plant. Write for his name and a copy of the NEW Commander Full Line Catalog No. 851.

COMMANDER MFG. CO.

4224 W. Kinzie St.

Chicago 24, III.

Any operator does precision tapping with a Commander TAPPER

Product of Commander . . . Builder of the Multi-Drill

#### Dayton Rogers Manufacturing Company Observes 30th Anniversary

The Dayton Rogers Mfg. Co., Minneapolis, Minn., short-run stamping pioneer, is now observing its 30th anniversary. Founded by Dayton Rogers for the purpose of manufacturing automatic toasters, the company, through Mr. Rogers' efforts, devised a method of producing metal stampings

in limited quantities without the expense of conventional tooling. Mr. Rogers combined this method with a technique of die setup for short runs; thus, the first automatic domestic toaster and the first short-run stampings were claimed to be born simultaneously.

Today, the name of Dayton Rogers Manufacturing Company has become almost synonymous with short-run

stampings. In the company's 65,000 square feet at the Minneapolis, Minnesota, plant, a concentration of the most modern custom equipment is operated



DYNAPRENE is better because it lasts longer. It is made of an exceptionally tough neoprene compound developed after extensive research and experience. It is made by the continuous vulcanizing process that guarantees accurate centering and even cure, eliminating thin, weak spots. DYNAPRENE is a truly modern cord made to withstand the rigors of constant use yet is priced only slightly higher than other types of cord that need frequent replacement.

Be sure to specify Whitney Blake type SO, SJO or SV-type neoprene jacket for your cord requirements.

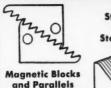




Dayton Rogers

around the clock. An organization of 350 persons is devoted to a highly specialized method of producing precision diecut stampings in small lots. An average of 450 to 500 new die designs is made every month.

# Set-up Aids



Step Set-Up Blocks Steel-Maple



Pyramid Set-Up Blocks

**T-Slot Bolts** 

Also Hand Wheels, Machine Handles, Levers, Cranks, Plastic Balls, Cast Iron Knobs, Machine Vises.

## REID TOOL

709 BAKER ST.

SUPPLY MUSKEGON HTS., MICH.

#### STRAIGHT RODS

1/32" to 1/2" Diameter Diam. Tol. .0005" on Rods Up to 6' Long. Diam. Tol. .001" on Rods Up to 12' Long.

> **Quick Delivery High Quality**

"PRECISION CENTERLESS GRINDING SINCE 1931"

## COMMERCIAL GRINDING CO.

6605 CEDAR AVE. Phone EN 1-3412 CLEVELAND 3, 0

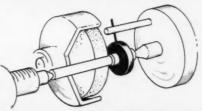


READY-MADE DRIVING DOGS for GRINDING or TURNING:

New MICRO - DOGS eliminate the work and time of making up special driving dogs for precision work on smaller parts. They're simple to attach by merely pressing the part to be turned into the flexible center-hole. MICRO-DOGS grip positively without marring, hold work to closest tolerances. Made of tough oil-resistant

neoprene, they can be used over and over. Six standard sizes to fit any shaft-diameter from 3/32 to 9/16.

These center-hole sizes available from stock: .080 105 - .167 - .230 - .355 .480. List price 60c each; inquiries invited on quantity prices and special sizes.



TRIAL OFFER

Assortment of 18 MICRO - DOGS, 3 each of 6 stock sizes, for only \$10 postpaid. Satisfaction guaranteed. Just specify . . . .

"TRIAL ORDER"

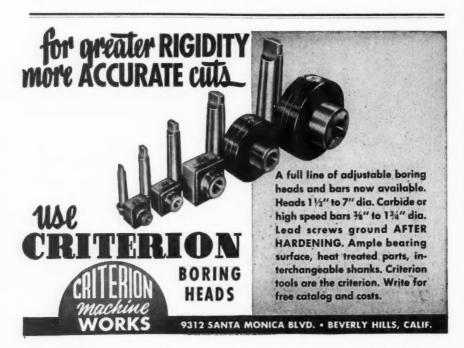
MICRO INDUSTRIES 1001 Washington Avenue So. Minneapolis 15, Minneapola



Modern plant of The du Mont Corp., Greenfield, Massachusetts

#### du Mont Corporation Now Housed in Modern Plant

A trim, modern plant in Greenfield, Massachusetts, now houses The du Mont Corporation. The plant, with its area, modern equipment, and modern facilities, is said to double the present capacity of the company for various production operations. The company produces the well-known line of "Minute Man" keyway broaches and kits, production-type keyway push broaches, special broaches, and magnetic bases for dial indicators, as well as "du Most" super high-speed ground tool bits.



Get a higher percentage of acceptable work in producing PRECISION HOLES

Amazing improvements in volume of production and precision of holes are on record as a result of giving mechine operators COM-TORPLUG. This unique hand gage, enables operator to keep machine adjusted better. Automatically and positively assures correct gaging to fractions of 10001". Detects out-of-round, tapers, bell mouth, etc. COMPLETELY AND POSITIVELY ACCURATE IN HANDS OF RELATIVELY UNTRAINED PERSONS—AT MACHINE OR RINSPECTION LINE. Applicable to work still in chuck if desired; shows actual size—justright for Statistical Quality Control. THE Answer to war conditions, Involving great urgency, green help, rough handling of gages.



COMTORPLUG gages bores to fractions of .0001"
COMTOR CO. 44 FARWELL STREET WALTHAM 54, MASS.

REQUEST BULLETIN 46

We also make COMTORGAGE Precision External Gage.

## **LEIMAN AIR PUMPS give you Greater Capacity!**



What's your air application? Send us details. Leiman engineers offer over 60 years' experience on thousands of air applications,

pump.

per size and weight of

CATALOG AND APPLICATION DATA SENT ON REQUEST.

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HANDLE your pressure, vacuum or suction jobs with much smaller Leiman Air Pumps. Save weight and space—run at lower r.p.m.—have fewer moving parts—no springs, gaskets or packing—no tips to renew—nothing to give trouble.

Metal Cleaning and Finishing without acids or scratch brushes

#### LEIMAN SANDBLASTS

Fast, low-cost, safe, uniform way to clean scaly, rusty, rough surfaces—prepare for plating and finishing—stencil letter and designs—more rapid matte or satin finishes. Use unskilled help. For Sandblasts—

write DEPT. E





Expanded plant of Rahn Granite Surface Plate Co., Dayton, Ohio

## Plant Expansion Announced by

Rahn Granite Surface Plate Co., 641 N. Western Ave., Dayton 7, Ohio, has announced the addition of a new wing to its plant. The new wing is housing the research laboratory and offices, providing more room for an enlarged stock of finished surface plates. The new laboratory provides for accelerated development work on granite surface plates and other basic precision inspection equipment made of granite. Some of the previous achievements of the laboratory are black granite parallels and angle plates which are now being produced to tolerances of 0.00005 inch for work of extreme precision.

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A.S.A. Plus Acme

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Makes Bushing Procurement Easy...Fast!



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MANUFACTURERS OF STANDARDIZED DRILL JIG AND FIXTURE BUSHINGS



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You should use Chicago "Safety Plus" Screws in Standard Listed Sizes.

They fasten products more securely, give a tighter hold for a neater appearance, and our three quarters of a century of experience in making fine threaded products guarantees a consistently more uniform accuracy to create sharper, smoother

threads for a quicker, easier fit. They save money, too, because fewer screws and a faster fit means LOWER COSTS all down the line. Call the INDUSTRIAL SUPPLY DISTRIB-

UTOR nearest you today. Ask him for Chicago and get "Safety Plus".



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ELECTRIC BOX TYPE · FLOOR AND BENCH MODELS

For Tools and Small Parts

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THE COOLEY FLOOR MODEL for HARDENING AND TEMPERING



Max. Temp.	Sizes	Price
2000°	12" x 8" x 18" 12" x 8" x 24" 12" x 8" x 36" 15" x 12" x 30"	\$985 to \$1350

All prices are less controls. Any standard controls available for automatic temperature control.

- With Cooley design, the door is virtually another wall, equally insulated with the others—entire hearth is usable.
- · Natural thermal convection.
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Controlling Pyrometers carried in stock—available for all applications.

Free on request: 

COMPLETE CATALOG 

"SHOP NOTES ON HEAT TREATING"

COOLEY

ELECTRIC MANUFACTURING CORP.
34 SO SHELBY . INDIANAPOLIS, IND.



A DoAll cutting tool specialist is shown demonstrating the company's complete line of cutting tools displayed on his mobile demonstration unit.

DoAll Cutting Tool Program

The DoAll Co., Des Plaines, Ill., is now introducing a complete line of cutting tools, industrial supplies, and gaging items in more of the stores in its national organization. The latest store to be included in its "cutting tool program" is the "DoAll Philadelphia Company" in Philadelphia. In making this cutting tool service available through its many stores, the company points out that industrial concerns can now depend on local DoAll stores for cutting tools and industrial supplies, as well as machine tool service.

The sales force of the stores in the

cutting tool program is augmented by cutting tool specialists who specialize solely in cutting tools and industrial supplies, having completed an intensive six-week training course in which they receive a practical education in all technical aspects—construction

and application — of cutting tools and industrial supplies distributed by the company. A good portion of this training is given at The DoAll Company's school in Des Plaines. In addition to the formal class work, the training course also involves trips about the country to see the factories producing items for the company's cutting tool line. The specialists are not only prepared to make recommendations, but they can clearly illustrate these recommendations with a complete tool display which is mounted on wheels and transported about by each specialist in a station wagon.

## LUERS

# PATENTED CUTTING OFF TOOL HOLDERS PATENTED CUTTING OFF BLADES

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured by

J. MILTON LUERS. 12 Pine Street, Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

MAKE SET-UPS

Conserve valuable production time by using the fully universal, easily-operated MASTER MULTI-SWIYEL VISE for intricate, angular set-ups in your shop. Three swivels instantly set any compound angle. Used in shops throughout the world. Interchangeable platen optional.

Write for Circular

DONOVAN MFG. CO. 80 BATTERYMARCH ST., BOSTON 10, MASS.



# PRODUCTION INCREASES... with TROYKE ROTARY TABLES



Sizes: 9 - 12 - 15 - 18 - 21 - 25.

See your dealer or write for Catalog No. 17, fully illustrated, showing all models and applications to various work.

Troyke Mfg. Co.,



Dividing Attachments can be furnished for all models of Wormwheel operated Rotary Tables except the Model BH-9.

Cincinnati 9, Ohio, U. S. A.

# HIGH SPEED PRODUCTION CONTINUOUS OIL GROOVING

WICACO CONTINUOUS OIL GROOVER cuts grooves of all descriptions, internal or external, continuous or intermittent.

Send us samples for grooving. We will return them cut to specifications, with a record of time and cost estimate. No obligation.

Ask For Descriptive Booklet And See How You Can Improve Your Production.



SINCE 1868

MACHINE CORPORATION

WAYNE JUNCTION, PHILA. 44, PA. Manufacturers of

Precision Machinery and Machine Parts
Roller Bearing Twister Spindles—Spindle Oiling Machine
Precision Internal Grinder — Screw Machine Products.



#### Metal-Working News in Brief

Bob Dando, formerly a salesman in the St. Louis area, has been transferred to the Philadelphia territory by Standard Pressed Steel Co., Jenkintown, Pa. Mr. Dando will cover eastern Pennsylvania, except in Philadelphia and Lancaster, going as far north as the Scranton-Wilkes-Barre area and west to Williamsport.

A change of name incident to the formation of a new company has been announced by Sub-Zero Products Co., Cincinnati 29, Ohio. Previously known as Sub-Zero Products Manufacturing Division, Deepfreeze Distributing Corporation, the new company will be designated simply as Sub-Zero Products Company to eliminate any possible confusion with Deepfreeze. This change in company name was made

also to establish the fact that Sub-Zero is a manufacturing firm rather than a distributor.

-0-

Detroit Die Set Corp., Detroit, Mich., has announced the appointment of Terry Machinery Co., 808 Hanna Bldg., Cleveland, Ohio, as its representative in the northeastern section of Ohio, including Cleveland. Youngstown, Akron, and other industrial centers.

Joseph Minarik, president of Abart Gear & Machine Co., Chicago, Ill., died recently at the age of 59. Mr. Minarik was a prominent figure in gear manufacturing and similar industrial circles.

-0-



And Gorham's exclusive "DEEP CORE DESIGN" allows many more redressings, too! A core of "M-40-U" Alloy, developed by Gorham expressly for wear, abrasion and heat resistance, is induction brazed deep in the shank, after which the entire center is finish ground, giving you wear material permanently supported by tough shank steel!

Gorham "M-40-U" Alloy Centers are available with Morse, B. & S. or Jarno taper shanks. Immediate delivery on popular sizes, "specials" to specification. Free literature gives description, dimensions, prices. Send for your copy today.

NOT JUST
NOT A TIP

BUT SOLID CORE

Gorkan TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14414 WOODROW WILSON . DETROIT 3, MICHIGAN
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

# SPEED UP SMALL PARTS ASSEMBLY

Parts feed automatically toward front—end reaching and fumbling. Bins taper toward front to form convenient semicircle—keep all bins within easy reach. Stacking, locking construction for rigid setups, easily changed when necessary. All-welded construction. Smooth, folded edges. New-design, adjustable hoppers provide increased capacity and permit regulated flow of parts according to sizes and weights. Two-sizes—tapered or straight sides.



IMMEDIATE DELIVERY

Write Stackbin Corp., 1083 Main Street, Pawtucket, R. I.

Manufactured and sold in Canada exclusively by Wickware-Stackbin, Ltd., Ottawa



# PALMGREN

# ROTARY TABLE The Only Table Having ROTARY FEED Combined with DUAL CROSS FEEDS



It's sensational—in price, construction, performance. Practically a universal milling machine. Designed for use on any Drill Press or Milling machine. Rout straight or curved, rabbet, drill, sand or mortise. Mill slots, grooves, keyways, squares, hexagons, curves, flats, dovetails, index or laying out work.

Precision made, it permits fine work to close tolerances. Rotary feed is calibrated in degrees; Cross Feed in thousandths. Cross slides and feeds are 2½" each side of center—4½" overall. Adjustable gibs on cross slides—40 to 1 worm and gear ratio in rotary feed. 4 Bolt slots—2 Lock screws. Order NOW!

Write for Circular No. 302

CHICAGO TOOL AND ENGINEERING CO.

Mirs. of PALMGREN PRODUCTS for over 34 years 8399 South Chicago Ave., CHICAGO 17, ILL.

No. 83—8" Table \$54.50

No. 82—Without \$39.75

#### Metal-Working News in Brief

Machine Tool Division of Sundstrand Machine Tool Co., Rockford, Ill., has announced the appointment of George Seeburg, former sales engineer, to the position of assistant general manager; T. B. Buell, former sales manager, to general sales manager in charge of overall sales policies; and Harry Leber, former manager of direct sales, who has succeeded Mr. Buell as sales manager of the company.

Harlan T. Pierpont, Jr., Norton Company's sales manager, Refractories Division, has been elected vice president of the Special Refractories Association. Mr. Pierpont was an abrasive engineer with Norton for 12 years until appointed to his present position in 1948.

-0-

Hanna Engineering Works, Chicago, Ill., has announced the appointment of Haldeman-Langford, 2580 University Ave., St. Paul 4, Minn., as sales repre-

sentative in Minnesota and northwestern Wisconsin, and Scott Equipment and Engineering Co., 54 W. 30th St., Indianapolis 8, Ind., as sales representative in central and southern Indiana and northern Kentucky. The companies will represent the complete line of Hanna air and hydraulic cylinders and control valves in their respective areas.

s.

Van Norman Co., Springfield, Mass., has announced the promotion of J. Paul Sturtevant, formerly safety director, to the position of assistant personnel director.





# ALL TYPES OF THRUST BEARINGS

We can make them up to 25" outside diameter. We are geared to handle all of your thrust bearing needs.

Inquiries Invited.

ACORN BEARING CO.

**66 Stanley Street** 

New Britain, Conn.

## MARK IRON, Steel and Carbides





Original Electric Etcher, Thousands in Daily Use Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly. • Three sizes to meet all requirements.

· Write for circulars and prices.

BREWSTER-SQUIRES CO.

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# :TESTING?

You Need the ACRO-MARKER

Reg. U.S. Pat. Off.

TO STAMP THE TAGS THAT RECORD YOUR FINDINGS.

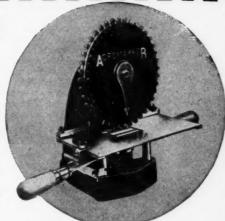
"Thousands are in use for stamping name-plates, tools, machine parts, dials, instrument parts, signal system tags, tool checks, etc."

ORDER YOURS NOW

Price of Model
No. 1 Illustrated.
ONLY - - -

\$187.50

'The Original Marking Specialists'



ACROMARK

9 Morrell

lizabeth 4, N. J.

#### Metal-Working News in Brief

Harry T. Kessler has been made president and treasurer and N. G. Tuthill has been elected vice president and secretary of Tuthill Pump Co., Chicago, Ill. Mr. Kessler served as executive vice president since 1943 and will, in his new position, direct an extensive expansion program which will introduce several new products into the Tuthill line.

Jiffy Mfg. Co., Hillside, N. J., has announced the promotion of Milton C. Weisenhorn, formerly representative in Illinois and Wisconsin, to a new position in which he will establish distributors throughout the country, as well as train salesmen. Thomas E. O'Shea has succeeded Mr. Weisenhorn as the company's sales representative in Illinois and Wisconsin, with headquarters at 20 W. Jackson Blvd., Chicago, Illinois.



The Omer E. Robbins Company has announced the appointment of W. S. Gallagher Co., Inc., 833 Grant St., Buffalo 13, N. Y., as exclusive representative for its line of precision angular equipment in western New York State, including Orleans, Genesee, Livingston, and Alle-

-0-

Howard E. Earl has joined the Sundstrand Machine Tool Co., Rockford, Ill., as chief engineer in charge of an engineering department for the development of the company's pnuematic and magnetic products.

gany counties.

-0-





PATENTED

END MILL

- SQUARE BLADES Easily Replaced.
- Simple, Accurate Blade Adjustment.
- Lowest Blade Cost.
- Cutters from 11/2" to 14" dia.



PAT. SHELL MILL

SEND FOR BULLETIN

W.T. HOWALD

MACHINE WORKS

182 SIGOURNEY ST., BROOKLYN 31, N. Y

# FLYNN --

FOR OVER 30
YEARS THE
PREFERRED
OFFSET
BORING HEAD

Wite

Write for Catalog

## RIGID - ACCURATE - SAFE

- Ground micrometer offset screw.
  - · Large, easy-to-read graduated dial.
    - "V" tool block, hardened, ground.

A model for practically every tool room and production operation.

FLYNN MANUFACTURING CO.

## GREENLEE HAND BENDER



for quickly making smooth small-radius bends in pipe, tubing, conduit

Forming small-radius bends without flattening or kinks is simple, speedy work with a GREENLEE Hand Bender. Ideal in the shop for pipe and tubing installations on machines... especially designed to form neat bends for sharp corners, nooks and other close quarters. Various models and

sizes for steel, copper, brass and aluminum tubing or pipe, rigid and thin-wall conduit



GET FREE FOLDER E-207 AND BOOKLET E-201. Complete facts and prices on the Greenlee Bender line. Write Greenlee Tool Company, 1 Herbert Avenue, Rockford, Illinois.

#### Metal-Working News in Brief

The Lees-Bradner Co., Cleveland, Ohio, has announced the appointment of Osborne Machinery Co., 880 Harrison, St., San Francisco, Calif.; The Swanson Machinery Co., 1422 Lake Drive, S.E., Grand Rapids 6, Mich.; and Klatt & Co., 329 20th St., Toledo 2. Ohio, as dealers for its line of hobbers and thread cutters.

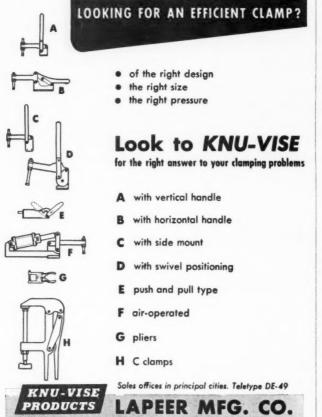
Standard Pressed Steel Co., Jenkintown, Pa., has announced the appointment of Landon C. Fuqua as sales representative. Mr. Fuqua will cover the Chicago area, handling all standard SPS lines, including Unbrako socket screws, Flexloc locknuts, and Hallowell shop equipment.

-0-

The election of Richard W. Banfield as vice president and David R. Ander-

son as controller has been announced by Pratt & Whitney and Chandler - Evans Divisions, Niles-Bement-Pond Co., West Hartford, Conn. Mr. Banfield will continue to carry on his duties as treasurer along with his new duties as vice president of the company.

-0-



WESTERN DIVISION: 422 MAGNOLIA ST., GLENDALE, CALIF.

3048 DAVISON ROAD . LAPEER, MICHIGAN

James E. Loshbough, wellknown designer and manufacturer of presses, died recently in Elkhart, Indiana. Mr. Loshbough founded the L & J Press Company in 1914, and in 1925 he resigned to establish the Federal Press Company in Elkhart where he served as president until 1951.





Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

> Write for catalog M on live centers

NIELSEN, INC. MICHIGAN



LAST WORD
WHEEL DRESSERS
Simplify the Job!

### PRECISION ANGLE TANGENT TO RADIUS WHEEL DRESSING

- Dresses grinding wheel at point of contact.
- Shortens dressing time.
- · Simplicity of setting.
- · Rugged for long life.

Also Distributors of SAMSON
OFFSET
BORING CHUCKS



LAST WORD SALES CO.

### Metal-Working News in Brief

The L. S. Starrett Co., Athol, Mass., has announced several changes in its sales personnel. Thomas R. Griffith, previously with the New York office, has been assigned the northeastern Pennsylvania-south central New York territory, replacing Clyde Starrett who was transferred to the home office. Tudor Garland has been assigned to the New York office under Don Gil-

bert, New York branch manager. Walter Clark has been assigned the north central New York territory, assisting Jack Lynch. Harold E. Sherwood, Jr., has been assigned the Louisiana-Mississippi-south Texas territory, replacing Robert F. Weintritt who resigned. Frederick Clarkson, formerly with Hanson-Whitney Co., Hartford, Conn., has been appointed assistant to C. G. Nordmark, advertising manager.



### HOW TO DUCK THE WELD-SPATTER PROBLEM

Use Protect-O-Metal and weld spatter wipes off as easily as water from a duck's back! With Protect-O-Metal you speed welding and save up to 85% of weld cleaning time and labor. Brush or spray P. O. M. in weld seam and on adjacent metal—weld—then brush off spatter in seconds.

Just a little P. O. M. goes a long way too—costs less than 1/10¢ per foot of weld protected, saves up to three times its cost in time savings alone. Order a trial gallon (\$3.25) satisfaction guaranteed or invoice will be cancelled.

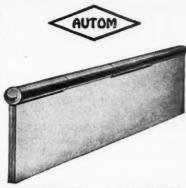


G. W. SMITH & SONS, INC., 5407 Kemp Road, Dayton, O.

Detroit Die Set Corp., Detroit, Mich., has announced the appointment of Frank L. Shoemaker Co., 4036 34th Ave., W., Seattle 99, Wash., as representative in the Washington-Oregon area. Also appointed was Charles W. Bringman, 3 1 0 Orlando Ave., Orlando, Fla., as representative.

--- 0 ---

DeVlieg Microbore Co., Ferndale (Detroit 20), Mich., has announced the appointment of W. S. Gallagher Co., Inc., 833-841 Grant St., Buffalo 13, N. Y., as its exclusive representative in central and western New York State.



### CONTINUOUS HINGES

Manufactured by

### **AUTO MOULDING** & MFG. CO.

WRITE FOR STOCK LIST 1114 E. 87TH ST. CHICAGO 19

### MODEL H AUTOMATIC **Chucking & Indexing Fixture**



- 1. 1800 light cuts per hour.
- 2. Either horizontal or vertical position.
- 3. Collets changed instantly.
- 4. Automatically knocks piece out.
- 5. Ratchet or degree indexing degree indexing added later if desired. Capacity 1".
- 6. Automatic indexer also added later. Model F—Both degree and ratchet indexing Capacity up to 214".

Write for Folders

J. W. DEARBORN • Ansonia, Conn.





Sterling Bin Front "Top Rim" Steel Stacking Box. Size: 18" x 12" x 6".

#### BOXES AGAINST THESE

Once you use and compare Sterling stacking boxes, you'll know why we invite comparision in design, construction, and price. Our "Top Rim" construction provides stronger support all around the box . no corner inserts to become loose and fall out. Efficiency in designing and manufacturing allows us to quote favorably on any type or size stacking box.

Write for literature and prices.

Sterling Factory Equipment Co., 183 Charles St., Providence, R. I.



Sterling "Top Rim" Steel Stacking Box with drop handles. Size: 18" x 12" x 6".



Quality Handling & Storage Equipment

### Metal-Working News in Brief

Norton Co., Worcester 6, Mass., has announced the appointment of George A. Park, former sales manager, eastern region, to the position of manager of distributor sales. To free Mr. Park for his new responsibilities, eastern and central sales regions have been combined under Donald L. Price as sales manager, eastern region.

The appointment of Joseph S. Imirie to the newly created position of assistant to the president has been announced by The Carborundum Co., Niagara Falls, N. Y. Mr. Imirie will render staff assistance to the president and executive vice president in the general management of the company's business and will assist in the development and promulgation of policies, organization structure, and programs.

BETTER SEEING TOOLS FOR INDUSTRY FOSTORIA Light the Vital Seeing Zone on Machine Tools, Inspection and Assembly Benches INCREASE WORKERS **EFFICIENCY** MODEL 3267-H-174 Overall length 323/4". Three instantly adjustable joints. Flat oblong in pkg. of 6 base for machine screw Single Units mounting. \$7.65 ea.

- Rugged Construction withstands vibration and rough handling
- Instantly Adjustable with flexible ball and socket joints
   Buked Enamel Finish Exterior, Smooth Gray —
- Reflector Interior high temperature White
- Reflector accommodates 100 watt or any A-19 or A-21 medium screw base lamp
   Wired Complete with switch socket and 8 ft. oil

1150.

resistant cord and moulded plug

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various type reflectors, arms
and bases for every industrial



THE FOSTORIA PRESSED STEEL CORPORATION FOSTORIA, OHIO

Localites are available through electrical wholesalers everywhere.

Syntron Cleveland Sales Company, representative of products manufactured by Syntron Co., Homer City Pa., has announced the opening of a new store located at 2919 Carnegie Ave.. Cleveland 15, Ohio. In addition to selling, the new store will rent Syntron power tools.

-0-Harry D. Siegfried, retired manager of sales, Steel Division, Henry Disston & Sons, Inc., Philadelphia, Pa., died recently at the age of 63. Mr. Siegfried was active in both The American Society for Metals and The American Iron and Steel Institute.



### STEEL STAMPS **Letters & Figures**

Letters and figures deep-cut in hardened, special formula steel assure clean impressions and long service. Faces are angled for added strength.

Chamfered corners make it easy to locate the base. At your mill





### STEEL MARKING DIES

For product trademarking or identification. Any style of lettering, designs, pictures, developed from your sketch or print. Straight or reverse. For hand or press. Whenever you get calls for marking dies, write us for prompt service.

HOGGSON & PETTIS MFG. CO.

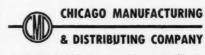
New Haven 7, Conn.



### PAY OFF in higher production

... Because they have better anti-scoring qualities to work under extreme pressures.

Use CMD on your lathe centers, die set leader pins, steady rests, machine ways, cams, broaches, thrust bearings, taps and dies, to name a few. In fact, CMD lubricants work every day under pressures of 40,000 to 50,000 pounds per square inch in thousands of plants from coast to coast.



1910 West 46th Street Chicago 9, Illinois

Attach this coupon to your letterhead for FREE SAMPLE KIT No. 712

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### Metal-Working News in Brief

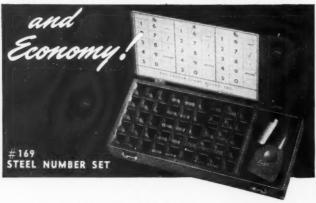
Henry K. Moore has been appointed field engineer in the southern Philadelphia, Pennsylvania, territory by The Bellows Company and will handle the company's complete line of air cylinders, air motors, air and hydraulic valves and controls, air-operated work

and tool feeders, air-powered drilling units, and air-powered work holding and clamping devices. His headquarters will be at The Bellows Co., 401 N. Broad St., Philadelphia 8, Pennsylvania.

-0-

Micromatic Hone Corp., Detroit, Mich., has announced the appointment

### NEW MARKING FLEXIBILITY



### With PARKER Type Holders and Interchangeable Steel Type Sets

Set hand or press markings quickly, easily to meet each day's changing needs. Parker Type Holders and Steel Type Sets assure new flexibility, making any required stamp available in seconds. Part numbers, dating, inspection numbers—a press or hand marking stamp for any material, any job is always at your fingertips. Number, and number and letter sets are scientifically compiled to permit the widest versatility, largest number of words. Threaded shank is furnished to allow hand stamp to be made into press stamp in an instant. Each set is crafted with traditional Parker skill to guarantee years of clean, permanent stamping—the convenience and utility of many dies in one economical unit.

Write TODAY for literature and prices on the many dollar saving Parker type sets available.



of William J. Pinkerton, formerly director of public and industrial relations, to vice president in charge of manufacturing; Arthur B. Kowalski to factory manager, succeeding the late Herman Thaler; Joseph Bolz and Glenn Rosene to the positions of division superintendents: Odiel Verhelst as superintendent of afternoon operations; and Myron P. Ellis as advertising manager.

-- 0 --

Adamas Carbide Corp., Harrison, N. J., has announced the appointment of
Frank W. Hogan
as assistant to the
sales manager.
Mr. Hogan will be
responsible
for the company's
sales promotion
and advertising.

#### MUMMERT-DIXON SWING FRAME GRINDERS Sizes 12", 14", 16", 18", 20" and 24" wheels.



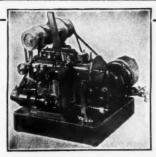
Ask for Descriptive Circular
MUMMERT-DIXON CO.
120 Philadelphia St. • Hanover, Pa.

### CAMS

We are fully equipped to GRIND OR MILL a complete range of CAMS to your specifications on our ROWBOTTOM Cam Milling Machines.

Your inquiries answered promptly.

HIMOFF MACHINE CO., INC. 23-16 44th Road Long Island City 1, N. Y.



### WALTHAM

**Pinion and Gear Cutting Machines** 

with revolving cutter will make 1, 2 or 3 successive cuts for watch pinions or may be used for fine pitch gears up to  $1V_2^{\mu\nu}$  dia. Blanks are held and indexed by work spindle and usually supported by a tail center. Only straight teeth can be cut.

#### WALTHAM MACHINE WORKS WALTHAM, MASS.

Pinion and Gear Cutting Machine, Thread Milling Machine, Cylindrical Sub-Presses, Cutter Sharpening Machine, Small thread milling and gear cutters, Small special machinery.

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### PRECISION

OFFER MANY EXCLUSIVE ADVANTAGES Plus
LOW COST

IDEAL FOR Punch Presses, Screw Machines, Printing Presses, Drill Presses, Die Casting Machines, Production Lathes, Pumps, Coil Winders, Conveyors, Etc.

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ASSURE Accuracy • Durability • Visibility • Low Maintenance Costs

Counters for Special Applications Designed and Manufactured

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2517 E. Norwich Ave.,

Cudahy, Wis.

Metal-Working News in Brief

The Macauley Machinery Company has moved its offices from Schenectady to the Sibley Tower Building, Rochester 4, New York. The company represents The Hartford Special Machinery Co., Hartford, Conn., manufacturer of automatic drilling and tapping machinery, in the Rochester, Schenectady, and Syracuse area.

At the annual meeting of the Council of Profit Sharing Industries held recently in Philadelphia, C. Neil Norgren, assistant general manager of C. A. Norgren Co., Englewood, Colo., was elected vice chairman of the organization.

-- 0 --

Rockwell Mfg. Co., Pittsburgh, Pa., has announced the appointment of E.

> W. Ristau as director of sales advertising and John Stolarz as sales manager of the Delta Power Tool Division. Mr. Ristau joined the company in 1951 and served as general manager of Rockwell tools. Mr. Stolarz was formerly assistant sales manager of the Delta Power Tool Division.

At the tip top of the Christmas tree is usually placed

The Top of the Tree to You!

At the tip top of the Christmas tree is usually placed the brightest ornament ... the shining Christmas star of hope... the symbol of a brighter and more glorious future.

So to you—our customers and friends—we wish you the top of the tree... the star of better things to come ... through the holidays and throughout all the coming days of your life ... a brighter, happier, more prosperous and more joyful future for you and yours.

Merry Christmas and Happy New Year

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD ... CLEVELAND 4, OHIO

-- 0 --

Thomas F. Mac-Laren has been appointed representative in the Chicago office of Brown & Sharpe Mfg. Co., 626-630 Washington Blvd., succeeding Howard K. Jackson who has been given special assignments by the home office in Providence, Rhode Island.



BORING

A SPECIALIZED CAM

JIG W

MILLING SERVICE...
JIG BORING...SPOT

WELDING...CON-

.. EXPERIMENTAL DEVELOPMENT



EISLER ENGINEERING CO., Inc. 734 So. 13th St. Newark 3, N. J.

#### THREAD MEASURING MADE EASY WITH NEW 60°THREAD TRIANGLES



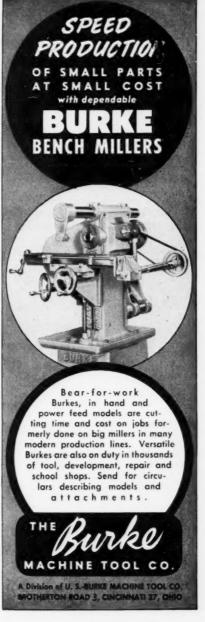
Quickly checks all 60° standard and special threads from 4 to 56 pitch...ANY O.D. No "fancy" calculations...just add a constant to O.D. That's all. Comes complete with chart.

SEND FOR TOOL CATALOG

MONIGOMERY & COMPANY, INC.
53-M PARK PLACE • NEW YORK 7 N.Y.



5407 Fountain Ave. Los Angeles 29



### new shop equipment

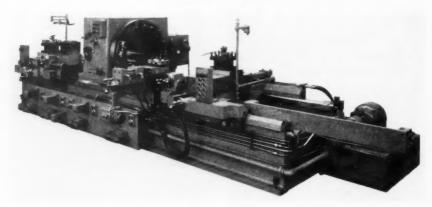
#### Lathe Developed for Machining Turbine Frame Assemblies for Jet Engines

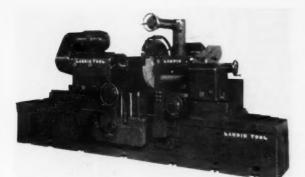
A special 42-inch swing large hollow spindle Hydratrol lathe which is designed for machining turbine frame assemblies for jet engines has been developed by Lehmann Machine Co., Chouteau at Grand, St. Louis 3, Mo. According to the manufacturer, the machine, at one setting, turns, bores, and faces all such machined surfaces, maintaining dimensional accuracy, relative concentricities, and squareness of surface difficult to secure when the workpiece has to be reset. The hole in the spindle and chucks is 18 inches,

and the distance face to face of the chucks is 30½ inches. Due to the flexibility of the workpiece, special chucks are provided and segmented bracelets surround the gripping surfaces to avoid distortion in chucking. Hydraulic longitudinal feeds with automatic stops are provided on the machine to meet all dimensional requirements.

À total of 16 surfaces is machined—8 faced, 5 turned, and 3 bored. A hand valve control provides rapid traverse to all slides. Coolant and chips are disposed to a pan in the rear in which the chips are held in the top section and the coolant flows to the lower section. The bed of the machine is 16 feet long x 42 inches wide

Lehmann Special Hollow Spindle Hydratrol Lathe designed for machining turbine frame assemblies for jet engines





Landis Type CHW Plain Grinder

verse is adjustable to any desired speed between 3 and 130 inches per minute. The swivel table may be adjusted for grinding tapered work. The wheel spindle of the machine operates in Landis Microsphere bearings which are babbitt lined.

with hardened steel ways. The machine provides 6 spindle speeds ranging from 21 to 100 r.p.m. A 20-h.p. motor drives the hydraulic friction clutches on the pulley shaft.

### Plain Grinder Is Designed for Grinding Large Diameter Workpieces

Designated as the Type CHW, a plain grinder which is available in a 30, 36, or 48-inch diameter swing and with a distance between centers of 48, 72, 96, or 120 inches has been announced by Landis Tool Co., Waynesboro, Pa. The grinder incorporates a 30-inch diameter grinding wheel which is driven by either a 10 or 15-h.p. motor. A variable speed headstock

drive is standard; however, a constant speed drive is available.

A double-type slide which is manually positioned and located under the wheelhead is said to alow a large amount of base movement. The slide ways and work carriage ways are pressure lubricated with filtered oil from a separate reservoir. The hydraulic table tra-

### Single-Face Flat Lapping Machine Has 60-Inch Diameter Lap

A machine equipped with a 60-inch diameter segmental-type bonded abrasive lap and designed for lapping large parts has been announced by Norton Co., Worcester 6, Mass. According to the manufacturer, the machine produces a clean, finished surface that is free from grit either embedded or trapped in pores or crevices, thus making the machine efficient for lapping soft metal parts. The bonded abrasive lap of the machine is said to produce bright surfaces that require no subsequent polishing operations.

The machine is claimed to provide unusual accuracy since the accuracy of the workpiece is controlled by a lap truing device. Original accuracy is maintained throughout the life of the lap by a simple diamond truing operation at infrequent intervals.

TOTAL SERVICES

Norton 60-Inch Single-Face Flat Lapping Machine

### Power-Operated Punch Press Has Rated Capacity of 5 Tons

Available in two models designated as the "Di-Acro" No. 1 and No. 2, a power-operated punch press which is said to have a rated capacity of 5 tons and can punch a 4-inch diameter hole in 16-gauge (0.062 inch) sheet steel or a \%-inch hole in \%-inch steel plate has been announced by O'Neil-Irwin Mfg. Co., 576 Eighth Ave., Lake City, Minn. The machine fea-



### Front Lever Punch

Hand operated bench punch for punching round, square, flat, or oval holes through 1/4" or lighter metal.

Send for new catalog sheets.

T. H. Lewthwaite Machine Co.

317 East 4th St., New York 17



O'Neil-Irwin "Di-Acro" Power Punch Press in operation

Columbia

**TOOL STEELS** for

all tools for all purposes



HOT WORK-SHOCK RESISTING:

Formite Firedie Formite No. 2 Buster C.E.C.

TOOL

COLUMBIA TOOL STEEL COMPANY

Main Office & Works Chicago Heights 6, III. tures a deep throat and is said to provide 180 strokes per minute. All moving parts of the press are housed in a welded steel cabinet so as to provide for maximum safety.

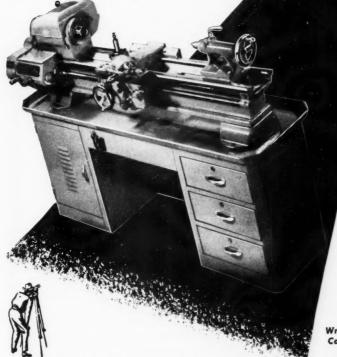
The press is portable and, it is claimed, need not be bolted down—the No. 1 weighing 540 lb. and the No. 2 weighing 715 lb. A material chute is built into the cabinet for delivery of slugs and blanked parts. The flywheel of the machine is driven by a ½-h.p. electric motor, and a choice of either a single-phase 110-220 volt or a three-phase 220-440 volt a.c. motor is offered. A complete line of punches and dies is available for the press.





A better Lathe from any angle

Judge it from any angle: for accuracy, stamina, rigidity or capacity (for size). Check its component parts—its spindle, spindle bearings, lead screw, apron, carriage, bed, gearing, or the power delivered by its drive—you will find the SHELDON Lathe a quality tool both in appearance and "under the hood".



Write for

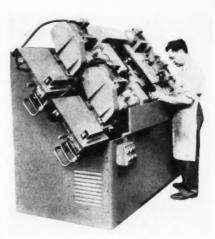
SHELDON MACHINE CO., Inc., 4250 North Knox Ave., Chicago 41, Ill.

### High-Production Boring Machine Used for Boring Wrist Pin Holes

Designated as the Model 355, a boring machine which is said to borize wrist pin holes in pistons at the rate of 700 parts per hour has been announced by The Heald Machine Co., Worcester 6, Mass. The operation consists of semi-finishing bores, finish grooving, and chamfering, The machine incorporates four special hydraulic cross slides mounted on a fabricated base with a two-station hydraulically-operated fixture positioned between the slides. A boring head and related drive equipment are mounted on each slide. The slides are constructed at a 40degree angle to the base, thus providing for ease and speed of loading and operation.

While the rear opposing slides are borizing one piston, the front slides are at rest for unloading and reloading. After a piston is positioned in the front station, a "memory" button is operated which, following completion of borizing at the rear station, automatically clamps the workpiece and starts the second half of the cycle.

Boring heads are arranged to operate continuously, and the coolant for each station, piped through the clamping ram



Heald Model 355 "Bore-Matic" Boring Machine

into the piston, shuts off automatically as the cross slides for the stations reach the rest position. The workpiece is hydraulically clamped in position by using the outside diameter of the piston, dome

### COOLEY HEAT TREATING FURNACES

### FLECTRIC BOX TYPE · FLOOR AND BENCH MODELS For Tools and Small Parts

### SHOWN HERE



### THE COOLEY BENCH MODEL RECIRCULATING AIR DRAW

Max. Temp.	Sizes	Price
1250°	10" x 6" x 14" 12" x 8" x 18"	\$475 to \$665

All prices are less controls. Any standard controls available for automatic temperature control.

#### 1. IDEAL FOR

pering.

- aluminum and beryllium copper heat treating.
  closely controlled mild and high-speed steel tem-
- 2. Stainless steel lined chamber.
- Accommodates up to 50 lbs. of parts.
   Holds temperature uniformity +5°-0°F.
- 5. 4 kw. input at 230 v. assures rapid heating.

Brown and Wheelco Control Pyrometer carried in stock—available for all applications.

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COMPLETE CATALOG 

"SHOP NOTES ON HEAT TREATING"

COOLEY

ELECTRIC MANUFACTURING CORP.
34 SO. SHELBY . INDIANAPOLIS, IND.

**NEW PROCUNIER TAPPERS** 

Work FASTER

Last LONGER

...and save Taps too!

Procunier Tapping Equipment is the answer to today's pressing need for tapping equipment that will meet current high-speed production demands and at the same time reduce maintenance and operating costs.

Developed by practical craftsmen—who have concentrated exclusively on developing, improving and perfecting tappers for more than 30 years—Procunier tappers offer the rare combination of high speed, dependable accuracy, lasting endurance and economy of operation. Special exclusive construction features enable them to cut threads faster, for longer periods — with fewer spoiled pieces, fewer rejects. Here's why:

- Tap breakage is practically eliminated due to the high sensitivity of the new Procunier cork-faced friction clutch which automatically regulates driving pressure. Thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch.
- Strain and wear are minimized and tortion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
- Chuck spindle is supported at both ends assuring true operation—avoiding tap wobble.
- Aluminum housings assure greater strength and rigidity with minimum weight—a vital factor for high speed tapping.
- 5. PLUS many other exclusive features.

WRITE TODAY for more complete details and specifications on the complete line of Procunier Tapping Heads and see why Procunier offers the "finest in tapping equipment."

#### PROCUNIER SAFETY CHUCK CO. 12 S. Clinton St., Chicago 6, III., Dept. 12

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

 Name

 Address

 City.
 Zone
 State



with the NEW "TRU-GRIP" Tap Holder

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter, it affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

### Procunier

SAFETY CHUCK CO.



THEY GRIND—NOT JUST RUB!

The RPM's stay up while grinding ... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind ... not just rub. Every mechanic knows this, but an inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work . . . longer wheel life.

MADISON-KIPP CORP.

208 Waubesa St., Madison, Wis., U.S.A.

Write for KIPP Air Tool Catalog at 3006

end, and the outside diameter of the rough wrist pin bosses on the inside of the piston.

#### All-Aluminum Box Handles 5.000-lb. Load

An all-aluminum materials handling box has been announced by Aluminum Company of America, 1950-J Gulf Bldg., Pitts-



Three All-Aluminum Materials Handling Boxes in stacked position

burgh 19, Pa. The box measures 60 x 42 x 36 inches and is of welded construction, using 61S alloy sheet and extrusions. Welds are made by either the inert gas shielded arc or sigma process.

The box can be used for handling finished products or as a scrap box. Mounted on low runners, it may be lifted by a fork truck and carried, stacked, or turned over and contents dumped. The runner is formed like an I-beam for added strength. Tiering lugs simplify stacking.

Weighing 245 lb., the box is said to accommodate a 5,000-lb. load. In addition, another feature of the box is its resistance to corrosion and corrosive fumes.



Here's a new standard duty ½" drill you can really "bear down on." Its heavy-duty universal motor resists stalling. Its 2-position auxiliary handle permits extra leverage on the real tough jobs. Its exclusive rear handle adjusts horizontally or vertically so you can lean into the work . . . apply more pressure—at any angle—with a natural, less tiring grip. If you want, you can even remove the rear handle and concentrate your whole strength behind the drill body. Or, in tight spots and close quarters, you can dispense with both auxiliary and rear handles for extra compactness, extra convenience.

This new Porter-Cable ½" drill was designed for high efficiency drilling in intermittent applications. Features: Heavy, precision-ground Jacobs gear-type chuck... double compound reduction gears ... combination ball radial and

thrust bearings . . . lower handle cast integral with housing for greater strength. UL approved.

At your Porter-Cable dealer's \$4850 New 1/4" Drill \$28.50

### PORTER-CABLE MACHINE COMPANY 5172 N. Salina Street, Syracuse 8, N.Y.

In Canada write: Strongridge Ltd., London, Ont.
Manufacturers of SPEEDMATIC and GUILD Electric Tools

### Cutting Compound Available in Concentrated Form

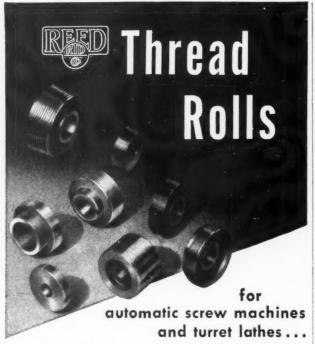
S. C. Johnson & Son, Inc., Dept. MM-3, Racine, Wis., has announced that "Wax-Cut," a new type compound which is said to improve metal-cutting action and reduce tool wear, is now available in concentrated form so that users may prepare their own cutting solutions. According to the manufacturer, the concentrated compound, a blend of special waxes, can be mixed 10 to 1 with any type of oil, including reclaimed motor oil, and paraffin and sulphurized oils. When di-

luted, Wax-Cut Concentrate serves as a wax-fortified cutting fluid that can be used in automatic screw machines, gear hobbers and cutters, milling machines, and oil-type grinders.

#### Power Punch Press Features 24-Inch Throat Depth

Designated as the Model No. 150, a power punch press with a 24-inch throat and a capacity of 10 tons has been announced by Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill. According to the manufacturer, the press has a stroke

length of 2 inches and is rated at a speed of 175 strokes per minute. The machine is equipped with a non-re-



produce uniform accurate threads economically.

### REED ROLLED THREAD DIE CO.

Manufacturers of
THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLL3
Worcester, Massachusetts, U. S. A.

D 252



Whitney Metal Model No. 150 Deep Throat Power Punch Press

peat clutch which, if desired, can be released for automatic feeding. The flywheel of the press is located in the rear, thus permitting easy feeding of stock and providing maximum safety. The Model No. 150 is said to have a 5-ton safety factor and is mounted on a sturdy all-welded steel frame.



### LEJEL presents A Low Cost PORTABLE HIGH FREQUENCY

Induction

### **HEATING UN**





### OLDERING



### ANNEALING





#### . SMALL AND COMPACT

Conveniently operated on bench or table-no mounting necessary

#### . ECONOMICAL OPERATION

No special power installation required. Operates on 110 volts, 60 or 50 cycle line at unity power factor.

#### . FULLY GUARANTEED

Guaranteed for continuous duty cycle and stated per-

This versatile unit is priced so low that every shop may now take advantage of modern induction heating techniques to improve quality and to increase production. Its simplicity of operation eliminates the need for skilled personnel.

> The Lepel Model 2 KW will meet the requirements of machine shops, toolrooms, research laboratories and educational institutions. It is especially suitable for hardening, brazing and soldering small parts of either ferrous or non-ferrous metals.

Complete unit with line connection and load coil

f.o.b. factory

#### WILL HEAT TO 1500° F.

%" steel rod 1" length in approx. 1 second
%" 3 seconds
14" 15 seconds 15 seconds 60 seconds Will melt 4 ounces of brass or steel in 4 minutes.
Equally well suited for heating of non-ferrous metal



#### LEPEL HIGH FREQUENCY LABORATORIES.

55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission Write for Lepel Catalog MMS-12



Michigan Powdered Metal Bevel Gear

### Powdered Gear Metal

A bevel gear made of powdered metal with an iron or steel base has been announced by Michigan Powdered Metal Products, Inc., Northville, the manufacturer,

Mich. According to the manufacturer, the gear has a high tensile strength and, when desired, can be impregnated with oil to minimize noise during operation. In addition, it can be hardened if required.

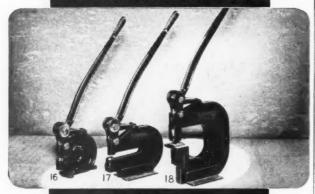
The gear is manufactured on a contract basis in sizes up to an outside diameter of approximately 4 inches. In the case of bevel rings, with the usual correspondingly larger inside diameters, sizes larger than 4 inches can be produced.

### Master Copy Dial Provides for Quick-Change Engraving

Designated as the "Preis-Panto" Model No. 1, a master copy dial which is said

to provide 41 characters for quickchange engraving in any engraving machine has been announced by H. P.

### WHITNEY METAL



### WHITNEY-JENSEN NOS. 16-17-18

BENCH PUNCHES

Roller-bearing, lever-type punches designed for bench use. No. 18 has higher and deeper throat than Nos. 16 and 17; comes with adjustable die shoes to permit use of close-fitting punches and dies. Capacity: — mild steel: (No.  $16 - \frac{3}{6}$ ° thru  $\frac{1}{4}$ °); (No.  $17 - \frac{1}{4}$ ° thru  $\frac{1}{4}$ °); (No.  $18 - \frac{19}{16}$ ° thru 12 ga.).

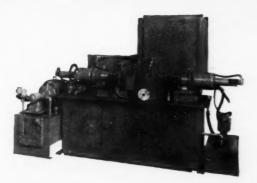
WHITNEY METAL TOOL COMPANY
110 FORBES STREET, ROCKFORD, ILLINOIS



"Preis-Panto" Model No. 1 Master Copy Dial

Preis Engraving Machine Co., 188 Industrial Branch, Hillside, N. J. Available with 3/8, 1/2, or 3/4-inch master copy characters in any one of several different styles, the dial measures 101/4 x 1114 inches overall, with a thickness of 34 inch exclusive of a knurled knob used to turn the dial. A spring-held ratchet locks the dial in position and can be readily locked or released with one finger.

Mounted on the copy table of an en-



### Completely Interlocked Drilling and Deburring Machine

THE diversity of uses to which Govro-Nelson Automatic Drilling Units may be put is illustrated by this recently designed, electrically interlocked machine which incorporates two such units, each equipped with a 6-spindle multiple head for drilling and deburring 6 holes in a steel disc.

In operation, the operator loads the part on a locator and presses a start-cycle switch which causes the part to be automatically clamped. One unit then feeds in automatically to drill six  $3/32^{\circ}$  diameter holes, whereupon the second unit feeds in automatically from the opposite side to deburr the 6 holes.

When the deburring unit completes its operation, the part is automatically unclamped so that the machine is ready for reloading by the operator. Output rate: Approximately 260 parts per hour.

If you have similar operations and would like to speed up your production rate, send samples and part prints and we shall be pleased to recommend the proper Automatic Units or quote on a complete set-up. Literature sent upon request.



### GOVRO-NELSON CO.

Machinists of Precision Parts for 28 Years
1933 Antoinette
Detroit 8, Mich.

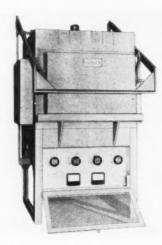
Automatic DRILLING UNIT

graving machine, the first letter or character is positioned for engraving and then each other character falls into the same position as the dial is rotated. The characters are of the sunken type; raised characters are available on special order.

#### Furnace Designed for High-Speed Tool Steel Heat-Treating Operations

An electric high-speed tool steel hardening furnace which is said to provide operating temperatures ranging from 1,650 to 2,500 deg. F. has been announced by Cooley Electric Mfg. Corp., 34 Shelby St., Indianapolis, Ind. The furnace is available in three models with chamber sizes of 6½ inches wide x 4 inches high x 9 inches long; 12 inches wide x 8 inches high x 18 inches long; and 12 inches wide x 8 inches high x 24 inches long.

Control of power is accomplished by the use of multiple-tap transformers arranged for select voltages to be applied to the "Globar" heat elements located at the top and the bottom of the chamber. Control of temperatures is effected by means of a standard pyrometer arrangement. The furnace is heavily insulated



Cooley High-Speed Tool Steel Heat-Treating Furnace

by high-temperature refractories, and the door is said to provide unusual thermal efficiency.



### RIVETING?



### FAST RIVETING WITHOUT NOISE

Put your production jobs on Linley Spinner Type Riveting Machines. No hammering! They spin rivet with twin rollers. In most cases the actual riveting time is one second per rivet, so that you can watch costs come down while noise is entirely eliminated! Direct Motor or Vee-Belt Driven. Bench or floor types.

Send samples of your work for free riveting, cost of equipment and true estimate on production.

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With 71/2" Dial Type Rotary Table Mounted



We also make a No. 2 Size for 12" Rotary Table. Can be had without Rotary Table.

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Rotary Tables • Multiple Spindle Index Centers • Vises • Screw Head Slotters

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392 Putnam Avenue Cambridge, Mass.

#### Improved Height Gage Can Be Used with Dial Indicator or Depth Measuring Rod

Homestrand, Inc., Larchmont, N. Y., has announced several improvements in its precision height gage which is available in 12, 18, and 24-inch models. According to the manufacturer, the improved gage incorporates a universal clamp which eliminates the need of an extra attachment when converting the height gage to a dial gage when necessary. The clamp, it is claimed, can be used with a wide variety of dial indica-

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This rack is made from special machinery steel finished to our specification . . . cut by expert mechanics on machines designed especially for this work.

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### STANDARD STEEL SPECIALTY COMPANY

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PLANTS REAVER FALLS, PA . . HAMMOND, IN



Homestrand Improved Height Gage with dial indicator attachment

tors. An extra screw on the side of the clamp is said to simplify shank width adjustments.

The height gage has been modified so that is can also be used with a depth measuring rod attachment without the use of an extra clamp. The depth measuring attachment is included as standard equipment. The height gage attachment arms are said to be identical in size for both the 18 and 24-inch models.

### 10-Power Magnifier Has Built-In Light Source

A 10-power magnifier which can be clipped to the pocket like a fountain pen has been announced by Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y. The magnifier, which uses two penlight batteries and bulb for illuminating the object, is designed for on-the-job inspection of small parts, castings, small joints and welds, reading micrometer and

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Make Haskins your reliable source for finest hand-cut ground or carbide cutters. Faster cutting, longer tool life, fewer

resharpenings. Cut labor and over all tool costs. All shapes, types and sizes. For catalog, write

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DETROIT 12, MICHIGAN



Bausch & Lomb 10-Power Magnifier in use

other fine scales, and similar shop and laboratory uses. The unit weighs  $2\frac{1}{2}$  oz., including batteries, and employs a unique lens construction which allows the light from the bulb to go directly through the lens and onto the object without any direct light reaching the user's eye.

Lead Checker

Designated as the "Sine-Line" Model 876, a lead checker which is designed for inspecting hob and worm leads, as well as hob flute spacing and thread spacing on multiple thread hobs, has been announced by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. The machine has a hob capacity of from ½ to 8 inches in diameter, with a maximum spread of centers of 13 inches. The unit is said to be capable of checking right or left-hand leads from 0 to 7.2 inches and is powered with a ¾-h.p. motor.

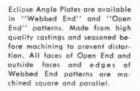
In checking leads, the rotation of the

In checking leads, the rotation of the hob or worm spindle and translation of the indicator table parallel to the hob spindle are effected by a sine bar table on the machine base. A precision ground master rack mounted on the sine bar table engages a pinion which drives the hob spindle through the hardened and ground master change gears. The machine is set up to check a given lead by selecting change gears according to a

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Accurate . . . Rugged





WEBBED	COST	LENGTH	1st ANGLE	2nd ANGLE	OPEN	COST
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No. 201 No. 202	4.25 5.50	41/2"	31/2"	41/2"	No. 301 No. 302	\$ 5.50 7.75
No. 203	7.00	7"	51/2"	41/2"	No. 303	9.25
No. 204 No. 205	9.00	8"	7"	5"	No. 304 No. 305	11.50
No. 206 No. 207	17.00 22.00	10"	9"	6'' 8''	No. 306 No. 307	18.50 24.00



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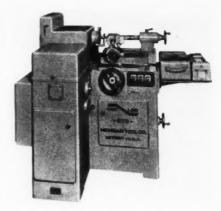
Infinitely Variable from 150 to 600 strokes per minute.

You name it and a PRECISION FLEXOPRESS can do it at a lower cost. Meet or surpass every maximum requirement for quality controlled stampings. Adjustable feed and integral rolls permit the use of materials heretofore called "impossible—not even practical" on a press.

To Pierce, Stamp, Swage, Form or Cut small pieces of Metal, Fiber, Plastic, Wood, Paper, Ribbon or Tubing.

### PRECISION WELDER & FLEXOPRESS CORP.

136 E. McMICKEN AVE. CINCINNATI 10, OHIO



Michigan "Sine-Line" Model 876 Lead Checker

table included with a formula sheet, and calculating the correct sine bar setting. Deviations from true lead are shown in ten-thousandths inch. Index plates are used to check hob flute and thread spacing. Two table drive speeds are provided.

### Profile Projector Features 60-Inch Diameter Viewing Table

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill., has placed on the market the Taylor-Hobson 200-Inch Profile Projector which features two sets of precision optics and a horizontal screen (viewing table) that measures 60 inches

Taylor-Hobson 200-Inch Profile Projector





### **CLAMPMASTER**



### THE VISE THAT HOLDS EVERYTHING

Eliminates fixtures for the holding of odd-shaped work pieces. Quick adjustment for positive holding of round, elliptical, tapered, triangular, or irregular shapes. Two moving jaws for quick centering of work. Available in four sizes for bench or machine work of all types.

THE VISE OF A THOUSAND USES

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### KARL A. NEISE

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in diameter. According to the manufacturer, tracings or templates can be mounted conveniently on the viewing table under which remote controls for all adjustments are provided. The optics provide 20 to 100 times magnification for workpieces up to 3 inches in diameter. and 10 times magnification is available for workpieces up to 6 inches in diameter.

### **Dust Collectors Feature** Special Hopper Valves

To meet the requirements of heavy-duty continuous grinding and other high dust volume applications, Torit Mfg. Co., 296

Walnut St., St. Paul 2, Minn., is now producing several models of its line of dust collectors with hopper bottoms and special release valves. The new-type collectors are available in both cabinet and cyclone types.

When the dust is of a grainy nature, a flexible diaphragm valve is recommended, primarily because of its speed of operation. The valve is of the Syntron-Mucon flow-control type and can be changed from fully closed to wide open by merely moving a lever through 180 degrees of arc. Nylon is used for the diaphragm, and the valve, it is claimed, will stand hard service and may be replaced easily and quickly.

When dusts are of sharp materials,

such as shavings, chips, and so on, a plate valve is recommended. This type valve is hinged to the bottom of

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### Look at these FEATURES:

- · Posture back rests, interchangeable and adjustable
- · Spring steel back bars for proper posture
- · Seats dished for comfort, plain or Presdwood-covered
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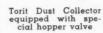
designed for comfort while working

This and other Hallowell Posture Stools and Chairs are described in Bulletin 704. Write for your copy. STANDARD PRESSED STEEL Co., Jenkintown 22, Pennsylvania.

### HALLOWELL SHOP EQUIPMENT DIVISION







the hopper and is faced with rubber. A simple, adjustable locking lever is said to hold the plate securely against the hopper bottom and prevent air leakage.

### KELLY

Fast Grip Toggle

### CLAMPS

For mounting horizontally or vertically. Toggle bar set at any angle. Complete with spindle.

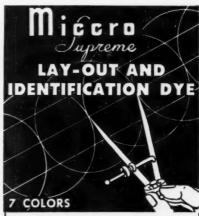
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For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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- These centers can be furnished to meet your requirements to any capacity up to the limit of the roller bearings. Write today for complete information.

GUARANTEED 3000 HOURS CONTINUOUS SERVICE

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   TOLERANCE LESS
   THAN .0001"
- . SIMPLE DESIGN
- ABSOLUTE CONCENTRICITY
   AND PERFECT ALIGNMENT
   FOR THE TWO BEARINGS

"The Center that STAYS on CENTER!"

MECHANICAL DEVELOPMENT CORP. 1628 BEAVER AVE. PALES BEAVER BEAVE

### Stub Drill Chuck Is Designed for Use in Multiple-Spindle Heads

Continental Tool Works, Division of Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich., has announced a stub drill chuck for use in multiple-spindle heads for drilling through bolt holes or clearance holes. Supported in a rigid truerunning spindle, the chuck projects a minimum distance and, it is claimed, uses short drills so that bushings and bushing plates are not required.

A U-shaped drive key engages notches in the shank of the drill and fits a groove in the faces of the collet and holder. This arrangement is said to provide a positive



Continental Stub Drill Chuck

drive and also prevent the drill from being pushed back into the collet under feeding pressure. The drill has notches in its shank for length adjustment.

### Improved Speed Reducer

Designated as the Model PG-7b, an improved speed reducer which is said to provide a 7 to 1 re-

provide a 7 to 1 reduction directly off the motor with spindle speeds of 45 to 2,000 r.p.m. has been announc-



Pull - Gear Improved Model PG-7b Speed Reducer

ed by The Pull-Gear Co., 21125 Dequindre St., Hazel Park, Mich. The unit is made for use with machinery using "B" type belts and is available in a ¾-inch shaft bore size.

The reducer is self-contained and made of an aluminum casting. The use of ball bearings throughout the unit is said to assure maximum life. The unit, it is claimed, can be easily and quickly installed on any machine simply by tightening a set screw.

ANNOUNCING!

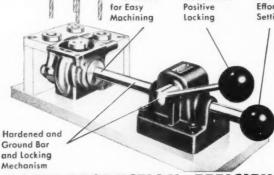
HEINRICH Grip Master

SCREWLESS

FIXTURE LOCK

1" Soft End for Easy Machining Cooking Setting

Guaranteed Positive Locking Setting



### **BOOSTS PRODUCTION, EFFICIENCY**

Now—at the request of industry—we offer the new "Grip-Master" Screwless Fixture Lock, applicable for fixtures and jigs used in drilling, milling operations, etc. It incorporates the same high-quality locking mechanism proved by industrial use in the famous "Grip-Master" Screwless Drill Press Vise. Pays for itself quickly by increasing production, cutting tooling costs, etc. See your Dealer, or write for details.

### NATIONAL MACHINE TOOL COMPANY DEPT. 112-M • RACINE, WISCONSIN

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Simply insert in holes, invert, strike sharply and you have centers and drill cir-cles perfectly located. Reduce time and eliminate spoilage of other methods. B sizes, from 18" to 3/4" U.S.S. Inexpensive — Last for years.

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. . . because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

You get more mark per dollar with THOR STAMPS. Write for catalog and prices.

The Pittsburgh Stamp Co., Inc.

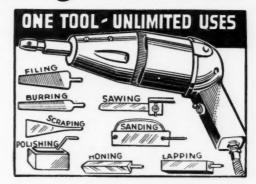
### B-R-E-A-K **Hand Finishing Bottlenecks**

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### PORTABLE • ELECTRIC RECIPROCATING TOOLS

These handy tools will cut out many tedious hand filing and finishing operations - Increase Production -Produce Uniform Work.

Light in weight - Delivers 1/8" or 3/8" fixed stroke at 1000 strokes per minute - Operates on 110 volts AC or DC.



### ACME TOOL COMPANY

73 WEST BROADWAY

NEW YORK 7, N. Y.

#### Micrometer Features Unusually-Hard Non-Peeling Chrome Surface

George Scherr Co., Inc., 198A Lafayette St., New York 12, N. Y., has announced a micrometer designated as the "Lustro Chrome," which features a chrome surface which is said to be unusually hard and non-peeling. The finish, it is claimed, protects the micrometer indefinitely from rust and discoloration.

The micrometer also features tungsten carbide-tipped anvils to provide long life. All graduations are said to be sharp and



Scherr "Lustro Chrome" Micrometer

clear against the dull chrome background to afford easy reading.

> Heavy Duty Toolholder

Designated as the "Huski-Cut," a toolholder which is said to be capable of extremely heavy feeds and very high

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\*Pneumatic Cylinders

	Strokes		
Bore	Horizontal	Vertical	
1"	5/8**	5/8 * *	
21/4"	1" 2" 3"	1" 2"	
3"		1/2" 2"	
4"	2" 21/2"	2"	
5"	3''	3"	
6"	3"	2"	





### **NEW CATALOG READY!**

Complete line of simple, adaptable, compact spring-return air cylinders. Cut costs and speed up production the modern, Air Power Way. Write today.



speeds has been added to its line of 10 standard holders by Wesson Co., 1220 Woodward Heights Blvd., Ferndale (Detroit 20), Mich. The holder is claimed to require no brazing, and the shank does not have to be ground.

Insert holes are broached for accu-



MEAD

4114 NO. KNOX AVE., DEPT. AA-122, CHICAGO 41, ILL.





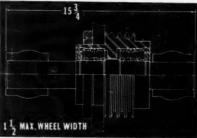
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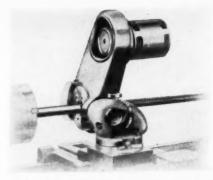
Inquiries regarding standard or special Spindles for grinding, milling, boring and drilling operations receive immediate attention.

The Whitnon
MANUFACTURING CO.
Property High St. New Britain, Conn.

rate alignment and rigid holding. Referring to the accompanying illustration, the insert can be adjusted by screw **B** without removing the holder from the machine. Screw **A** controls the holding pressure on the insert. All control screws for locking and adjusting are never subjected to chip wear, it is claimed. The holder is offset to provide for generous chip clearance and is available in three standard styles and 40 standard sizes.

#### Automatic Thread and Worm Cutting Attachment Can Be Installed on Standard Lathe

An automatic thread and worm cutting attachment which can be installed on a standard lathe has been announced by National Threading Machine Co., 126 Market St., Paterson, N. J. One advantage of the unit is that the actual cutting is done by means of a tool which moves around the workpiece eccentrically at high speed in a single, continuous operation. The attachment is designed to cut long standard vee threads; acme, buttress, and rounded threads; and, within close limits, modified square threads



National Automatic Thread and Worm Cutting
Attachment

The threads are produced with feeds which are said to be well synchronized in relation to the thread surfaces. According to the manufacturer, the attachment is capable of generating threads at a velocity of between 800 and 2,000 feet per minute, depending on the type of material used. The attachment can be used to cut steel (plain and alloy), as well as all non-ferrous and brittle metals.



# SALVAGES MILLING CUTTERS SHARPENS SAWS IN GANGS

This low cost straight flute grinder sharpens milling cutters and circular saws. Automatically indexes a gang of saws, one row of teeth at a time and sharpens them with an accuracy of plus or minus .001" for the entire lot. Salvages milling cutters and saws that might otherwise be scrapped. Write for literature on 57T automatic grinder. The Wardwell Mfg. Co., 3166 Fulton Road, Cleveland 9, Ohio.





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N.A.M. Pioneer Award Given to Gray

Most modern Nibbler for Template Cutting, Tool Rooms, Shipbuilding, Aircraft Parts, Aircraft Tubing, Sheet & Plate Shops.

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Partable — move directly to job; a time saver for both small and large shops.

33/4" stroke; adapt-

able for other work.

Low first cost —

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Turn out more work, easier, faster, with lightweight, vibrationless MALL Pneumatic Tools that reduce fatigue to a minimum. As an example, MALL No. PG-K1030L Lever Throttle Die Grinder weighs only 3/4 of a pound — is easily held in the palm of the hand. 30,000 rpm guaranteed speed, with maximum of .0015 runout at the collet. Accuracy, precision, ease of operation is a certainty.

Write For Illustrated Bulletin And Price List. 40 Factory-Owned Service Warehouses, Coast To Coast, To Serve Our Customers and Thousands of Dealers.



TOOL COMPANY

7814 S. Chicago Avenue, Chicago 19, Illinois

# Center Distance Gage Provides Direct Reading of Hole Spacing

Designated as the "Center-Mike," a center distance gage which is said to provide a direct reading of hole spacing without additional setups has been announced by Sorensen Center-Mikes, Inc., 264 Kossuth St., Bridgeport 8, Conn. The gage is basically a vernier gage and a slide rule combined. In operation, the unit is first set to the closest points on the two holes and then is reset to the farthest points on the same holes. While making these settings, the two lengths are automatically registered and their average value com-



Sorensen "Center-Mike" Center Distance Gage in use

puted, appearing on a double-size vernier scale.

The Center-Mike is available in three sizes for maximum

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More reliable than tags, far cheaper than special plates. Portable—safe—fast! Repays low cost dozens of times over in time and money saved. "Universal" Model (shown) has 4 etch heats—120 to 700 watts. Other sizes for all sizes of work.

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# New Grind for Carbide-Tipped Reamer

center distances of

4.000 inches, 7.400 inches, and 12.400 inches, respectively. All sizes will

measure center distances ranging upward from 0.240

inch to their respective maxima. Work contacts are made of tungsten carbide and scales are machine graduated. Standard equipment includes a hardened and ground center-distance standard and a wood case.

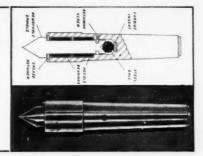
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., has announced the development of a new grind on its "flute long" carbide-tipped reamer. According to the manufacturer, the new method of grinding enables the user to rough and finish ream and burnish in one operation. The reamer is ground 0.005 to 0.010 inch undersize the first half inch and builds up to finish ream size. Above the finish ream section.

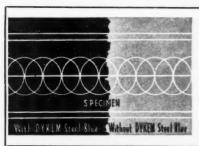
# Deeper Cuts — Faster Speeds

# WEE LIVE CENTERS

Exclusive SMALL HEAD design of WEE Live Centers combines live center advantages with size and accuracy of dead centers. 30 to 40% less overhang means deeper cuts, faster speeds, no chatter. Used by hundreds of leading concerns. No. 2 M.T., \$21.00. Request complete price list.

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HERBERT CROSS & SON, Bala-Cynwyd, Pa.





# DYKEM STEEL BLUE

### Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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### THE DYKEM COMPANY

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# SPECIAL MACHINES

# Built for Drilling, Reaming, Tapping, Boring and Milling

These units are in use in the largest production plants in the world and give dependable service on every application. The unit is ruggedly built throughout and designed to give years of constant, accurate service.





Lee Engineering Company, Inc.
4700 BURLINGAME DETROIT 4, MICHIGAN

lands are circular ground for burnishing to produce a micro finish. The "flute long" reamer is carbide tipped the full length of the flute.

### Cut-Off Tool Features Semi-Circular Disc-Type Blade

Designated as the "Cir-Cut," a cut-off tool which features a semi-circular disctype blade with the cutting surface on

# USE ECONOMY

Headless Set Screws

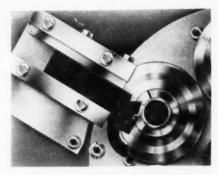
Set Screws



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# ECONOMY MACHINE PRODUCTS COMPANY

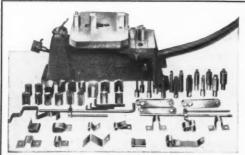
5212 Lawrence Ave., Chicago 30, III.



New Britain "Cir-Cut" Circular Cut-off Tool set up for use

the periphery has been announced by Cir-Cut Division of The New Britain Machine Co., New Britain, Conn. The blade is made of high-speed steel and is mounted in a holder with all but the necessary cutting edge protected by an envelope or shroud. According to the manufacturer, the tool is so ground that when the lead is in the same plane as the front of the holder, it is properly positioned, and the toolholder is accurately located in the machine so that the cutting edge of the tool is on the spindle center line.

The periphery of the blade is hollow ground to collapse the chip and lessen heat generation from chip flow on the edges of the tool. Control of chip during the cut is maintained by grinding the shroud and not the tool edge. Toolholder adapters are available to complement the toolholder assembly. The adapters are said to assure proper alignment and permit a total of 0.090-inch height adjustment to allow for spindle variations.



BENDER CUTTER

Users report the Multiform Bender one of the handiest tools in the shop. No special tooling . . . Bends, Cuts, Punches, Flats, Rounds Into Any Shape, Clamps, Brackets, Springs, Busbars, Wire Forms, Aircraft Work, Steel

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1/4" to 4" MATERIAL

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GARBERDING

STOP-PINS



FINGER STOPS

STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices.

GARBERDING FINGER STOPS made in uniform width to fit any standard width slot. Just grind ends to fit.

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TOOL MANUFACTURING CO. 925-941 Wrightwood Avenue, Chicago 14, Illinois

# SAWMASTER HACK SAW



In every plant there is a large variety of uses for the SAWMASTER Hack Saw. Its self-contained portability, its low cost, and rugged construction to handle work in capacities of 6" x 6", 4" x 4", and 6" x 7" with 5 models make it an economical, accurate, efficient and versatile machine. Many superb features. All SAWMASTERS operate with efficient push-cut action.

Write for Bulletin 300.



MILLER-KNUTH MFG. CO. OMAHA, NEB.

### Dresser Designed for Use on Cylindrical and Bench or Pedestal Grinders

L. Newman, 1001 24th St., Oakland 7. Calif., has announced an emery wheel dresser which is available in two models for use on cylindrical and bench or pedestal grinders. The Model No. 5, illustrated herewith, is designed for use on cylindrical grinders with either a straight or tilted table. This model can be used in a vertical position or tilted halfway down and set at any desired angle to the grind-

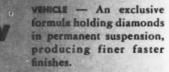


Newman Model No. 5 Emery Wheel Dresser in vertical and tilted positions

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# Formula for finer faster finish

DIAMONDS-Clean, sharp, particles, uniformly graded to N.B.S. standards, evenly distributed for fast cutting, lapping and polishing.



**EXPERIENCE**—Thousands of the country's most important jobs have proved Hyprez versatility and savings of time, materials and production costs.

HYPREZ, the original Diamond Compound, is available in types and grades for every finishing requirement. Packed in 18- 9- and 5-gram sealed cartridges for use with the Hyprez Applicator Gun.



Valves, Seals Tools, Parts



Dies, Molds Hobs, Gages

Write Dept. S-1252 for complete information or free demonstration

# supplied.

Cut Thread

ing wheel. The

positions can be reversed with the dressing - wheel

unit attached on the short side, either tilted or

The Model No. 4, designed for use on

a bench or pedestal grinder, is said to

be accurately bal-

anced and equip-

ped with precision sealed ball bear-

ings. Replacement

wheels for both models are avail-

able, and specially-

developed wheels for cleaning and

trueing diamond

wheels can also be

straight.

Studs Northwestern Tool & Engineering Co., 119 Hollier Ave., Dayton 3. Ohio, has announced the availability of several additional sizes of cut thread studs. The company's line now includes a wide variety of studs ranging from 2 to 20 inches long in sizes of  $\frac{1}{18}$ -18,  $\frac{3}{8}$ -16,  $\frac{1}{2}$ -13,  $\frac{5}{8}$ -11,  $\frac{4}{4}$ -10,  $\frac{7}{8}$ -9, and  $\frac{1}{8}$ .

### HYPREZ DIVISION ENGIS EQUIPMENT COMPANY

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Chicago 5, III.



# No. 4B PUNCH

Capacity—1/4" hole thru 1/16 gage iron. Length—81/2"; Depth of throat—2", Weight—3 lbs.

Stock size punches—1/16" to 9/32" by 1/64". Can be had complete in metal box as shown or in cardboard carton.

### W. A. WHITNEY MFG. CO.

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# Monarch Precision SHAPLANE Radius Tools



**Five Models for** 

### LATHES, SHAPERS, PLANERS, AND BORING MILLS.

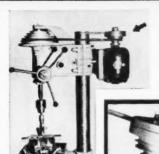
RANGE 1/2" TO 3" RADIUS (MODELS ALSO AVAILABLE FOR CONVEX CUTTING, AND CONCAVE RADII TO 6" ON PLANERS, ETC.)

# C. B. TEETER Tool Room Specialties

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# "PULL-GEAR" SPEED-REDUCING PULLEY Increases Drill Press Capacity

Made In
3 Motor Shaft Sizes
1/2" • 5/3" • 3/4"



Amazing new internally geared speed reducer doubles drill press capacity. Greater power, greater efficiency, greater productivity.

Provides the correct speed and power for larger drilling, reaming, tapping and boring on light presses. Easily installed in five minutes. Adaptable to all type machines. Spindle speed range approx. 45

to 2000 RPM. Write for literature.

Some Territories Open to Jobbers

THE PULL-GEAR CO.

21125 Dequindre St., Hazel Park, Michigan



# Live Center Has Maximum Rating of 6,400 Lb. at 100 R.P.M.

A heavy-duty live center which is said to have a maximum rating of 6,400 lb. at 100 r.p.m. or 3,200-lb. thrust load with a maximum point runout of 0.0002 inch has been announced by Holub Industries, Inc., Sycamore, Ill. Said to be ideal for taking exceptionally coarse cuts or turning heavy workpieces, the center incorporates a pair of matched precision-made tapered roller bearings which are designed to absorb unusual shock loads and abuse.

An adjustable retainer ring controls preloaded rigidity and bearing wear, and

a heavy-duty grease seal retains the lubricant and prevents the entrance of cut-



Holub Heavy-Duty Live Center

ting oils, metal chips, and so on. The center is available with No. 5 and No. 6 Morse tapers.



Write today for Catalog No. 108 which shows all other standard grades of Newcomer Carbides.



S-6 Carbide is new and different — industry-proven on mcchining Armor plate, rough steel forgings and castings. Even though S-6 Carbide can be used at high machining speeds, its greatest tool life is obtained at speeds slower than those at which other grades of carbide can be successfully used. S-6 removes stock fast because of the heavy feeds permissible. S-6 Carbide, because of its extremely high strength, is excellent for interrupted cuts.

NEWCOMER PRODUCTS, INC.

General Sales Offices
PITTSBURGH 21. PENNA

Plants at LATROBE, PENNA.

# Pipe and Tube Notcher

Designated as the "Twin-Notch" Arc-Fit, a pipe and tube notcher designed for use with a punch press for notching both sides of a pipe end with a single stroke of the press has been announced by Vogel Tool & Die Corp., 1825 N. 32nd Ave., Melrose Park, Ill. According to the manufacturer, accurate alignment of the notches is automatic, and the time required for the double notching is only two to three seconds. Interchangeable dies, punches, and spacers make the unit adaptable for notching 1/2 to 2inch pipe and tub-

When tubing is fed into the die, the die punch goes inside the tube end. As the press ram comes down, the punch is driven laterally to notch one side of the tube end and then in the opposite directions.





LATROBE, PA.

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Surface Plates, Angles, Parallels, and Straight Edges are all backed by over forty years of practical experience. You pay no more for this added assurance of accuracy and durability.

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# CUTTING and TUMBLING BARRELS

for better work in less time! For uniform cutting down, wet or dry grinding, tumbling, pulverizing and mixing, the unique de-sign of Hartford Triple Action Barrels saves time and money and produces better resuits. Hartford Barrels give a TRIPLE ACTION in tumbling the material, an "over and over, end to end, folding-in" motion combined, which quickly grinds off burrs, and finishes and smooths the general surface of any article in the load. These barrels are available in two sizes, large and small, and with both motor and belt drive. Hartford also makes steel burnishing balls scientifically correct in

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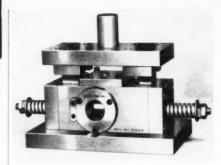
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design and material for each specific job. Bulletin on request.



. . . Yes, all sizes of perfectly threaded holes, but no. all shapes . . . the Messers Wood and Spencer are very fussy about perfection in taps. They like for their taps to work to within .00001, if you are not particular, or to decimal point ad infinitium, if you are. Wood and Spencer have prepared a chart to guide you in all tapping operations, such as spindle, threads, alignment and lubrication. Send for this chart and check before you start, for top tap efficiency. Use the right tap at the right time . . increase top life.

The Wood & Spencer Company Oleveland 3. Chic



Vogel "Twin-Notch" Arc-Fit Pipe and Tube Notcher

tion to notch the other side. Cutting is from the inside out, which is said to leave clean edges that require no further finishing.

## Manual Gun Is Designed for Inert Gas-Shielded Metal-Arc Welding

Designated as the Model No. 20 "Aircomatic," a gun which is designed for use in manual inert-gas-shielded metalare welding operations has been announced by Air Reduction, 60 E. 42nd St., New York 17, N. Y. Designed to operate with currents up to 500 amperes, the gun is said to be ideal for welding copper, bronzes, stainless steel, nickel, and steel. The gun utilizes a water cooling device and a water-cooled welding cable which are said to permit high current capacity without sacrificing lightness and flexibility of the gun.

Airco Model No. 20 "Aircomatic" Manual Welding Gun



# Here'S THE SOLUTION OF A DAILY PROBLEM

How to make set-ups for tapping and reaming without wasting valuable time and yet have them accurate enough to insure perfect work is an ever-recurring problem. It can be quickly solved, however, by doing nothing more than changing tool

Take the Ziegler Holder, for example. With it, all you have to do is to align the work within 1/32" of accuracy on the radius (1/16" on the diameter) and the holder automatically corrects the inaccuracy.

Think of the time you can save by following this modern method of spindle alignment! And, of course, time saved means money saved!



Types to machine used tapping or reaming

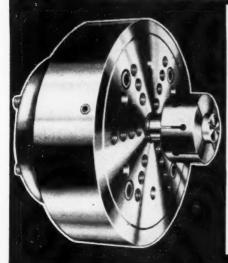
W. M. ZIEGLER TOOL CO. ING HOLDER

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# Reasons for You to get the Facts on SPEEDGRIP CHUCKS

- 1. They increase production.
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Speedgrip Precision Internal Chucks will save you money on second operation work.

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SPEEDGRIP CHUCK 820 N. WARD STREET

## Rubber Wheel Designed for Grinding Ball-Bearing Raceways

Designated as the No. R3 Bond, a rubber wheel which is designed for grinding ball-bearing raceways has been announced by Bonded Products & Grain Division, the Carborundum Co., Niagara Falls, N. Y. According to the manufacturer, the wheel provides free cutting action, thus minimizing the generation of heat and ensuring a high degree of accuracy. The wheel is said to have unusual form-holding characteristics and shape maintenance throughout its life. Only two types of grain are available; namely, one that

meets a wide variety of grinding requirements and the other which is intended for use in special production conditions.

### Band Saw Guide Has Micrometer Adjustments

A micro-precision band saw guide which is said to be designed to speed production, save saw blades, and prevent wasted machine time, labor, and materials by holding the saw blade rigidly and close to the work has been announced by Carter Products Co., Inc., 960 Michigan Trust Bldg., Grand Rapids, Mich. Ac-

cording to the manufacturer, micrometer adjustments may be made while the machine is in operation, thus assuring maximum



Delta-Crescent Band Saw Machine equip-ped with Carter Micro-Precision Band Saw Guide

support of twist and thrust loads. The guide wheel is guarded to protect the hands.

The body and brackets of the guide are die cast of high-strength zinc alloy with a 41,000 p.s.i. tensile strength. The guide is available for saw widths of 34, 11/4, and 13/4 inches.



Order direct: Individual holder \$5.95 - with wires measurements within plus or minus .00015 - \$7.95.
Set of 12 holders
with Mounting Stand \$60.00 -

per inch.



The Scully 3 Wire Holder features a coil spring securing the single thread wire. The spring allows the single thread wire to assume the Helix angle of the thread, and to maintain parallelism with the

double wires . . . measures up to 3" diameter with

standard wires. Each holder has accurately spaced

slots for one American Standard pitch only: 32, 28,

27, 24, 20, 18, 16, 14, 13, 12, 11, 10 threads

MACHINE COMPANY SCULLY 62 WALTER STREET BRIDGEPORT 8, CONNECTICUT



DTR resinoid bonded diamond wheels are making headlines for quality, delivery, and price. Our completely new 32 page catalog tells the whole story. Write for your copy today!

DTB DIAMOND TOOL
RESEARCH CO.. Inc.
305 East 45th St New York 17. N. Y.
MUrray Hill 4-0466-7-8



Just sip a tap adaptor into the Dahlstrom Fap Guide and twist. Your hand tapping will be quick and accurate. For machine tapping, the spindle top is center-bored to fit the tail stock center of a lathe. Size 13" x 8" x 14". Included 9 adaptors (8/32 to 3/4"). Taps not furnished. Branch Mfg. Co., North Branch, Minnesota. Write for Pampblet—Also shows Chucks and Autostobs.

Dahlstrom TAP GUIDE



The perfectly flat surfaces of sliding and rotating parts, air and liquid tight seals, plastic and die casting molds are quickly accomplished with this machine tool.



giving an accurate, mirrorlike finish in less time than any other method. Ideal for plug gauges. Saves as much as \(^2\)\_3 in lapping time.

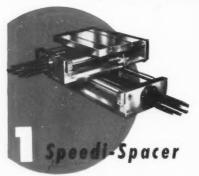
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SPITFIRE TOOL CO.

2933 N. Pulaski Rd.,

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# Time savers in any shop



This jig-for-all-jobs makes any good upright or radial drill the equal of an expensive jig borer in speed and accuracy SPEEDI-SPACER saves the cost of and waiting for, jigs and fixtures, as well as their storage, obsolescence and maintenance. Does big jobs fast at lowest cost.



QUEEN CITY MACHINE TOOL CO

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QUEEN CITY MACHINE TOOL CO. 233 E. 2nd Street, Cincinnati 2, Ohio

### Shaper Designed to Manufacture Punches in One Setting

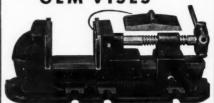
Cedar-West Tool Co., Inc., 90 West St., New York 6. N. Y., is now marketing the Ottmann Punch and Form Shaper which is said to be designed to manufacture punches with punch and baseplate made



Ottmann Punch and Form Shaper

of one solid piece. With the shaper, the punch is first roughed out close to the scribed line or template. Without resetting, the punch is then finished with a small tool which is said to take fine cuts of 0.0005 inch. Surfaces are said to be parallel within a tolerance of 0.0005 inch. According to the manufacturer, no special tools or cutters are required, and the punch can be finished in one setting.

# GEM VISES



Made in a range of sizes and types, to handle most any kind of machining operation, where vises are applicable. Write for circular, etc.

J. E. MARTIN MACHINE WORKS, Springfield, Ohlo

# People work better when they SEE BETTER



# MAGNI-FOCUSER

SPEEDS PRODUCTION
Leaves both hands free to work

In Bell Telephone Laboratories:

Precision machinist working on a milling machine finds Magni-Focuser an invaluable seeing aid.

MAGNI-FOCUSER'S

matched prismatic lenses give needle-sharp magnification. Comfortably light weight. Fits over regular glasses. Leaves both hands free. Normal vision may be resumed by lifting head. Magni-Focuser—the binocular magnifier—reduces eye-strain and prevents squinting—thereby speeding production, increasing accuracy and minimizing the chance of errors and accidents.

Gauge reading, layout work, inspection, tool and die work are just a few of the jobs that need the Magni-Focuser. Speeds precision assemblies, blue print work. Restores the usefulness of the skilled hands of many older workers whose vision needs a seeing aid.

Magni-Focuser can help your plant produce better. Immediate delivery, 10-day trial without obligation, Return to us if not satisfied, \$10.50.

Send for descriptive folder

EDROY PRODUCTS CO. Dept. P. New York 17, N. Y.

# Stadoil DIAMOND LAPPING OIL doubles the life of diamond wheels

Here's the lubricant that removes all gum or glaze, and keeps wheels from loading. With Stadoil, no pressure is needed in sharpening. Thus, wheels and cutters last twice as long. You get extra fine tool edges, free from scratches.

Stadoil is recommended by all diamond wheel manufacturers for carbide tool grinding. It's also an excellent carrier for diamond dust. Over 6000 industrial users. 18th year. Sold in half-pint to 50-gallon quantities. Order from your industrial distributor, or if he can't supply, order direct from factory.

For information, write Dept. 4

STADOIL MANUFACTURING CO., EL MONTE 3, CALIF.

### Head Is Designed for Small Lathe **Production of Duplicate Parts**

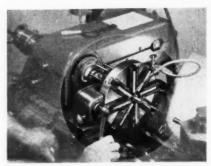
Designated as the Roto Head, an attachment which is designed for multiplying small lathe production of duplicate parts has been announced by General Roto Co., 8914 Melrose Ave., Los Angeles 46, Calif. According to the manufacturer, the head will fit any engine lathe having between a 9 and 12-inch swing and can be installed with no lathe alterations. The unit utilizes eight different single-point tools mounted in slidable



\* COLLIS Equipment fills today's important production needs so well because they are made by men skilled in making this type of equipment. Supply the proper unit from a complete range of types and sizes for Drill Sleeves and Sockets, Lathe Centers, Chuck Arbors, and Drill Drifts. We will handle your orders promptly.

# THE COLLIS COMPANY

DEPT. A, CLINTON, IOWA



General Roto Head in use on engine lathe

spring-loaded toolholders which are equally spaced around the face of a rotating head, each tool pointing towards the lathe axis. The head is mounted on the cross slide dovetail, replacing the conventional cross slide.

Tool infeed is actuated individually by rotating a hand crank. A cam attached to the crank advances the tool to its full cutting depth by contacting either of two buttons located behind the toolslide. Each button is equipped with a micrometer adjustment, and two diameters are said to be possible for each cutting bit. As the crank continues to rotate, the head automatically indexes to the next station, the cutting cycle repeating successively with each toolslide. By varying setups of the different bits, up to 16 different diameters, it is claimed, can be produced on one job.

All longitudinal feeds are made by conventional carriage travel, and stops that automatically index and limit longitudinal feeds are provided for each station. Work is supported at the tool point by three universally-adjustable rollers. No center drilling of work is required, and no tailstock support is needed.





Full-size tips, uniformly brazed, have diamond ground cutting edges. "North-West" tools are tipped with Carboloy cemented Carbide.

Many of your requirements can be met by altering standard tools from stock!

Precision built flat, single point, carbide cutting tools.

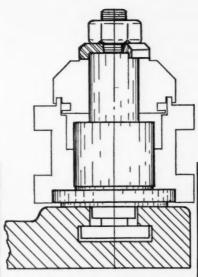
Carbide cutting tools made to your own specifications. A complete line of Standard Carbide cutting, turning and boring tools. Available immediately from stock.

Distributors in all leading cities.

Write for catalog.

# THE NORTH-WEST

8 North Kilmer St. Dayton 7, Ohio



# HEAVY-DUTY, SELF-INDEXING TOOL POST TURRETS

Note: Exclusive Super-Solid Center Post Construction

Tool up with Lynn turrets. They increase variety and output. Save time. Built for all sizes and makes of engine and turret lathes and screw machines. **Note:** The extra large bearing on the post assures absolute rigidity, increases precision and makes for longer life. They are accurate, without installing more lathes.

# F" SERIES TURRETS

For Atlas and Logan lathes, either pilot wheel or lever type. **Special Features:** Automatic indexing—double gibs for wear adjustment—heavy duty design square turret ways—lifetime precision tool indexing—turret head lock. Greatest possible precision assured.

Write or Phone ATlantic 7267

# LYNN MANUFACTURING CO.

1121 So. 7th St., Minneapolis, Minn.

### Soldering Iron Heats to Soldering Temperature in 40 Seconds

Designated as the Model R-115A, a lightweight two-speed soldering iron which, it is claimed, heats to soldering temperature in 40 seconds has been an nounced by Snap-on Tools Corp., Kensha, Wis. Fast heating is accomplished by the use of a two-speed circuit. Depressing the thumb button on the handle delivers 100 watts at the tip for fast heating or for extra heat for heavy soldering operations. Once the iron is heated it "idles" at 25 watts to maintain normal tip temperature for continuous



Snap-on Model R-115A Soldering Iron

soldering operation. To aid in efficient heat transfer, the ceramic-enclosed heating element is extended almost to the

> end of the hollow soldering tip.

The tip is specially plated with "Vanderlov," a substance which is said to protect the copper from deterioration. According to the manufacturer, the plating takes tinning very readily and can be used under continu o u s operating conditions. A standard tapered chisel-edge tip is furnished as standa r d equipment; however, six additional interchangeable styles and shapes are available. The iron weighs 9 oz. and is said to be easy to handle and control in tight spaces.



The only portable machine which reproduces 15 sizes from one master alphabet.

The only one with adjustable copy holding slides for multiline engraving in one set-up.

Self-centering holding vise for nameplates.

### Send for Booklets

I-S 27 portable model • H 27 heavy duty model

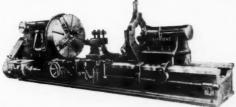
NEW HERMES, Inc. 13-19 University Place, N.Y. 3

In Canada: 359 St. James St., Montreal World's Largest Manufacturer of Portoble Engraving Machines

# Improved Non-Soluble Oils

The Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa., has announced several additions to a nd improvements i nits line of non-soluble cutting oils which, it is claimed, provide for reduced friction together with unusual cooling, anti-

# MORE POWER TO YOU!



For ordnance, shipyards and other shops having heavy turning, facing and threading operations.

# NEW SIMMONS EXTRA HEAVY

# 48" SCREW CUTTING ENGINE LATHE

51" swing over ways, 36" swing over carriage . . . 20-ft. (10' centers) min. bed length to any length required by 5-ft. increments. Speed range RPM 1 to 144; feeds (56) .0045 to .504; also optional feeds. Tailstock spindle dia. 7". Lead screw dia. 3\(\frac{1}{2}\)".

Geared Head—Anti-friction bearings in headstock and dual Timken bearings on spindle. Front bearing dia.  $11\frac{1}{4}$ ", rear 8". Direct to spindle and internal face plate drive. Shipment 4 to 5 months. Write today for full details.

### SIMMONS MACHINE TOOL CORPORATION

1745 N. Broadway, Albany 1, N. Y.

N. Y. Offices: 50 East 42nd Street

# Announcing -NEW NO. 5 KELLED Power

# KELLER Power HACK SAW FEATURING 9" × 9" CAPACITY

Here's another KELLER Power HACK SAW with plenty of capacity, and plenty of speed! Takes any metal up to 9" x 9" and gives it that neat "professional" cut and a more accurate fit.

Equipped with a patented pressure feed control of 0 to 200 pounds that minimizes wear on saw blades.

Send for Bulletin No. 1052 for complete specifications on the new No. 5 and nine other models of KELLER Power Hack Saws.



Sales Service Machine Tool Co.

PRESS RITE PRESSES . SHAPE RITE SHAPERS . KELLER POWER HACK SAWS

2355 UNIVERSITY AVENUE . ST. PAUL 4, MINNESOTA



weld, and metal-wetting characteristics. The improved oils are transparent in all

grades from light to heavy.

Atlantic soluble oils are water-emulsifiable products which are intended for use in grinding and cutting operations. Soluble Oil No. 1 is designed for ordinary work, and Soluble Oil No. 4 has pressure characteristics which are said to make it suitable for heavy-duty work. Both oils are good coolants and rust preventatives.

Other improved oils include Cutting Oils No. 20 through No. 45 which, it is claimed, do not develop offensive or rancid odors and will not indelibly stain.

### New Line of Standard **Cutting Tools**

Supplementing its line of engineered cutting tools, Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill., has announced a new line of standard cutting tools to be marketed under the trade name of "Illinite." The Illinite line includes a complete selection of standard end mills, saws, milling cutters, key slot cutters, hobs, and shaper cutters, as well as a wide variety of gear measuring blocks, tool bits, die filing machines, and die files.



# SPEED KF'S "FLYING BOXCARS"

De-Sta-Co Toggle Clamps maintain efficient production of Fairchild C-119 "Flying Boxcars" at Kaiser-Frazer's Willow Run plant, KF engineers welded a small contact bar to the clamps and taped them to protect the skin surfaces of the main canopy. Model No. 210-S Toggle Clamps used on this welded fixture also provide precise alignment of the glass retainer of the canopy structure during the riveting operation. Rapid toggle action and ease of work removal make De-Sta-Co Clamps the logical choice for this production application.

The same principles apply to your work holding problems in assembly, welding, bonding, machining or other production processes. Select from over 40 fixture or portable models. Positive holding pressures up to 4000 pounds.

Write today for your copy of the De-Sta-Co Catalog describing available stationary and portable toggle clamps.



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# PREIS-PANTO ENGRAVING MACHINE



PRECISION BUILT LIGHT IN WEIGHT

Model No. UE-3

The engraver sees the work and the copy—all within the working area. Precision engraving, of steel, all metals and plastic, is easy, with this machine. Write for details.

H. P. PREIS ENGRAVING MACHINE CO. 657 Route 29 Hillside, N. J.



# SIMPLEX-M ABRASIVE BAND GRINDER



The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and auto-

matic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

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cut on increasingly popular plastic ! - wood - copper - aluminum and similar metals is YOURS with versatile Atlantic Skip Tooth Blades. Atlantic's extra wide tooth v spacing whisks away chips - ends clogging! binding! heating! The rigid set of individually gauged teeth, the advanced skip tooth design promote increased accuracy and greatly prolonged blade life. Heat hardened teeth on special steel body eliminate most costly blade breakage, damaging crystallization. Whatever your blade requirements are - or may be investigate the Atlantic Skip Tooth - another triumph of Atlantic adaptability and efficiency.

SEND TODAY FOR LITERATURE ON SUPERIOR ATLANTIC BAND SAWS!

Atlantic

ATLANTIC SAW MFG. COMPANY, Inc. Brewery St., New Haven, Conn.

### Permanent Magnets Available in Kit Form

A "You-Try-It" kit of permanent magnets which are designed to enable industrial planners to devise their own uses for permanent magnets within their own plants has been announced by Carbolov Department of General Electric Co., 11143 E. 8 Mile Rd., Detroit 32, Mich. The magnets are said to be useful in a wide variety of applications, such as recovering tools from liquid tanks, feeding sheet metals into presses, holding steel plates for painting, affixing models on plant layouts, and picking metallic waste from



Carboloy Permanent Magnet Kits

conveyor lines located in the plant.

The kit is available in two models. Shop package No. 1 contains 48 Carboloy permanent mag. nets, in eight styles, with up to 2 lb. of pull for each unit. Shop package No. 2 contains 18 larger magnets, in four different styles, having a pull of from 3 to 12 pounds.



it pays to use

# BILLINGS WRENCHES and SHOP TOOLS

Mechanics and production men like Billings quality and high standards of accuracy. They can depend on Billings tools to do the job. Billings tools-designed and produced by drop forging specialists-save time and money

because they last longer.

Billings Industrial Distributors maintain complete stocks of Billings Wrenches and Shop Tools to fill a wide variety of demands.



### THE BILLINGS & SPENCER CO. TOTALLERS

SIZES AND PRICES AVAILABLE FROM YOUR BILLINGS INDUSTRIAL DISTRIBUTOR WRENCHES . SHOP TOOLS . INDUSTRIAL FORGINGS SINCE 1869

# Marking Tape for Identification of Tools

Labelon Tape Co., Inc., 450 Atlantic Ave., Rochester 9, N. Y., has announced a marking tape designed for the marking and identification of tools and tool cribs. parts in manufacture, electrical circuits, laboratory apparatus, articles for repair, and so

Writing is made to appear on the tape by the pressure of the writing instrument alone. An ordinary lead pencil is entirely satisfactory; however, a stylus may be used if desired. The writing, which is solid black on the all-white tape, is

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"NIBBLE YOUR COSTS"
FOR TUBE SLOTTING, TUBE SHAPING AND CUTTING FLAT SHEETS BY TEMPLATE OR TO A SCRIBED LINE.

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# SHARP

# NAMEPLATE MARKING



The nameplate on your product is your signature. Keep it neat and legible! Accurate location and alignment are assured with this

NAMEPLATE DETAIL PRESS.

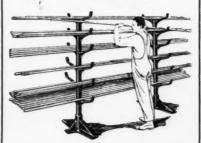
- Simple Operation
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SPEEDS UP STOCK-ROOM SERVICE

The BROWN SECTIONAL RACK saves the time previously lost in end-hauling each bar of stock its entire length from the old-style. closed-side Rack, the Brown Rack requiring but a few inches of side movement. Each length, width and thickness of stock is displayed in gold-fish visibility for instant selection. Workmen waiting for stock are served without waste of time.



Any time you require additional storage space, all you need do is add more units. If you want to relocate it at any time, you can do so quickly for it is unattached to the building.

It is a simple, durable article made of metal in five styles. It can't burn, warp, sag or twist; depreciation is practically nil. SEND FOR BULLE-TIN No. 26-B DESCRIBING

BROWN'S QUICK-SERVE RACKS

# BROWN ENGINEERING CO.

120 N. THIRD ST READING, PA.

actually beneath a transparent plastic layer which protects it against smudges, dust, dirt, oil, water, and various types of chemicals.

According to the manufacturer, the tape is unaffected by temperatures ranging from minus 40 to plus 160 deg. F., is absolutely fadeless, and provides a permanent label that can be stripped off one surface and reapplied to another many times without leaving a mark or losing its adhesive quality. The tape is available in a wide variety of colors, sizes, and widths.

## Pilot Valve Is Designed To Handle Air, Vacuum, Oil, Water, and Inert Gases

A solenoid pilot valve measuring 3 inches in height and designed to handle air, vacuum, oil, water, and inert gases has been announced by Valvair Corp., 987 Beardsley Ave., Akron 11, Ohio. The valve features a body and cover made of hightensile zinc-base alloy and a standard coil which is said to be adaptable to either continuous or intermittent service. The coil is completely sealed from the fluid or

air flowing through the valve; however, the fluid or air is used to cool the coil. The only moving parts



Adjusting bevel gear mesh with a laminated shim is a matter of two seconds to remove a lamination!

The shim in this case is made of LAMINUM®, our exclusive

material. It is a "solid" unit built up of 16 layers of .002 brass. It peels quickly and easily. Each shim removed adjusts the bevel gear position by two thousandths.

You save time by easier machining tolerances on the housing; you save time by eliminating pesky assembly machin-



# SHIM HEADQUARTERS SINCE 1913

Check Our Stampings Division For Your Stamped Parts Requirements

ing; you save by not tying up a machine intermittently. IT'S EASIER!





Valvair Solenoid Pilot Valve

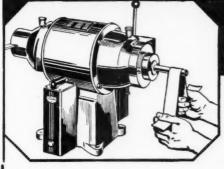
in the valve are the plunger and the stem.

The valve is available in 2-way and 3-way, either normally open or normally closed, models and can be furnished with orifice sizes of  $\frac{1}{16}$ ,  $\frac{3}{32}$ , and 1/8 inch with 1/4-inch pipe tap.

For further information on any product mentioned in this issue - use the READER SER-VICE CARDS between the covers.

3312 UNION STREET . GLENBROOK, CONNECTICUT

# **Cut Polishing Time up to 80%**



Write for BULLETIN 500 showing types for all secondary finishing operations.

# SCHAUER SPEED LATHES

Users report production increases of 50% to 100% over former methods when Schauer Speed Lathes are used to polish, lap, de-burr or finish metal or plastic parts. These high-production machines do the job speedier, better, and at lower cost.

SCHAUER MANUFACTURING CORP. - Originators of Today's Speed Lathes

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CINCINNATI 36, OHIO .

# STOP DUST With DUSTKOP





300 cfm to 10,000 cfm per unit (22 models) standard, pre-tested, available from stock.

> Ask for catalog 605-2

No obligation.

# **NEW SHOP LITERATURE**

Steel Shop Furniture. An eight-page illustrated catalog (No. 1) issued by Industrial Bench & Equipment Mfg. Co., Division Brunette Tool Co., Inc., 89 South St., New Britain, Conn., describes its line of steel benches, maple top benches, steel work stands, steel bench legs, steel tote boxes, and welding benches. Specifications are included, and a consumer price list is also available.

Grinding Wheels. A 24-page illustrated catalog (Publication No. G-618) released by Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, provides useful data on its line of grinding wheels which are available in all popular sizes from 12 inches in diameter up. Included is information on how wheels are made; firing of wheels; finishing, testing, and inspecting wheels; and applied research.

Industrial Radiography Supplies. A 104-page plastic-ring bound booklet issued by The Keleket X-Ray Corp., 243 W.

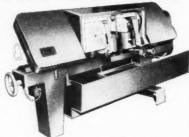
4th St., Covington, Ky., lists, illustrates and describes a wide variety of X-ray supplies essential to industrial radiography. I tems covered range from a stirring rod used to mix developing solutions to lead building blocks used in the construction of special X-ray rooms. Product descriptions are clear and concise. The booklet is available to persons concerned with industrial radiography addressing requests on their company

letterheads.

Welding Equipment and Supplies. A 12-page twocolor illustrated catalog (No. 17) issued by Air Reduction, 60 E. 42nd St. New York 17, N. Y., describes the equipment and supplies employed in Aircomatic welding operations. The No. 3 and No. 20 Aircomatic Guns and the Aircomatic Head for automatic operation are fully covered. Wires for use with the equipment are also discussed.



Why? Because Kalamazoo's hydraulic frame control is coordinated with the feed control to give just the right blade pressure for smoothest, most accurate cutting of tubing and thin wall sections. In addition, the saw frame cannot drop accidentally and damage material or saw blade. Yes . . . here's another reason why Kalamazoo is synonomous



with precision metal sawing at lowest cost . . . another reason why it will pay you to specify Kalamazoo Metal Cutting Band Saws. Three models, all available with coolant system and casters.

MACHINE TOOL DIVISION

Kalamazoo TANK and SILO CO.

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FLAT TWISTED AND ROLLED SECTION

Special Lengths and Types PROMPT DELIVERY

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All Purpose Tool Room And Machine Shop Vises.

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Adjustable Pressure Production Vise. For Information Write Dept. M

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# SOLVE SLUDGE PROBLEM WITH NICHOLSON'S

With the introduction of a new oileliminating feature, Nicholson air traps enable you to enjoy the advantages of the positive intermittent action of a float-operated air trap without the common problem of oil congealing on the mechanism and impeding or stopping its action. Three types; pressures to 1500

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lbs. For details send for ... Bull. 651



# HI NICHOLSON & CO

TRAPS · VALVES · FLOATS

Air Cylinders. A 16-page two-color bulletin (No. 731) released by Lindberg Engineering Co., 2469 W. Hubbard St., Chicago 12, Ill., describes and illustrates its line of air cylinders. Diagrams and charts explain the various capacities, types of mounting, and so on, of each type cylinder. Information on features is also in-

Slide Rule for Weights of Sheet Metals. To individuals addressing requests on their company letterheads, Dayton Rogers Mfg. Co., Minneapolis 7, Minn., is offering an improved slide rule weight

calculator for all flat sheet material. This rule is designed to provide the exact weight of sheet metals to be used in the production stamping of parts. Once the width of the sheet or strip is known and also the pitch or number of lineal feet required for 1 to 100 pieces, the exact overall weight can be easily determined. The weight calculator is also provided with constants giving the exact weight of sheet aluminum, sheet copper, sheet bronze, sheet lead, and sheet steel.

Micrometer Stop-Countersink and Cutters. Severance Tool Industries, Inc., 724

Iowa Ave., Saginaw, Mich., has issued a six-page folder describing and illustrating its micrometer stopcountersink which features a non-rotating head and a positive - locking adjustment. Cutters and additional accessories are also described.

Milling Machines. An eight-page twocolor bulletin (No. 25) issued by U.S. Tool Co., Inc., Ampere (East Orange), N. J., describes and illustrates its line of cam - controlled automatic "Multi-Millers" which are designed for milling operations on small parts requiring accurate and intricate cuts.

Arc Welders. An eight-page twocolor folder issued by Hobart Brothers Co., Troy, Ohio, fully describes and illustrates its line of gasoline engine driven arc welders designed for a wide variety of welding operations. Complete electrical and mechanical specifications are provided.



When you can combine the versatility of an O.B.I. press with the construction and performance standards of big, expensive machines, you get a real production tool that will give you the best possible long term economy . . . And that's just what you get with Verson O.B.I.'s. Just check these features-gears running in oil . . . heavy allsteel frame . . . machine cut steel gear and pinion . . . split cap main and crankpin bearings . . mechanically interlocked pneumatic clutch and brake unit . . . full electric controls . . . many others. Six models with capacities from 90 to 250 tons.

# VERSON ALLSTEEL PRESS CO.

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Write for Bulletin OBI-49.

So. Lamar at Ledbetter Dr. DALLAS 15, TEXAS

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# FAST METAL CUTTING ... MADE EASY!

If it's speed you need . . . SawMore Metal Cutting Machines are your first choice. SawMore Machines cut accurately. Operate at lowest cost.

These highlight features — built into every **SawMore** Machine—help you achieve top production.

- Self-aligning blades
- Automatic feed
- Gears-constant mesh
- Positive compensating feed

Write for complete information on the advantages of SawMore Machines

MAQUOKETA COMPANY

CLINTON, IOWA



# BLUE M MUFFLE FURNACE

Faster . . . easier heat treatment in your shop.

Automatic temperature control from 150°F to 2000°F

Model 2010 Price \$315.00 W-4¾"; H-4"; -D-9½" Electronic Control & Indication. Temperature is selected and held automatically by simply setting a pointer dial. Power Selector Switch adjusts wattage to low, medium or high, preventing loss of time and current by avoiding "overshooting" or "undershooting" the temperature required.

Heating Elements are Modella resistance wire specially made to Blue M specifications. Units are on all four sides. 4½" of fire brick and 1½" of Therm-O-Block provide dual insulation on 6 sides.

See your local dealer or write for Bulletin

BLUE M ELECTRIC COMPANY
306-308 West 69th Street, Chicago, Illinois

Bench Model Bending Brake. A six-page two-color circular (No. BB-52) released by Dreis & Krump Mfg. Co., 7418 S. Loomis Blvd., Chicago 36, Ill., describes and illustrates the "Chicago" bench model universal box and pan bending brake for bending sheet metal. Cross-sectional diagrams and specifications are included.

Production Units. Barnes Drill Co., 860 Chestnut St., Rockford, Ill., has issued a 28-page two-color bulletin (No. 150-C) which describes and illustrates its line of "Barnesdril" Production Units. Various machine arrangements are shown, and specifications on standard units, as well as data on work transfer equipment, automatic chip disposal, power units, and electrical controls, are provided.

Hack Saw Blades. The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill., has issued a six-page bulletin (No. 50-823) which discusses and provides technical data on its molybdenum blades, tungsten blades, and "Safety" blades of vanadium alloy steel for use in hack sawing machines and hack saw frames. A "Speed and Feed Chart" for cutting different materials is included.

ARROW TOOL & REAMER CO., Established 1916

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Arrow's engineering skill and production experience gained during 36 years as a major supplier of precision tooling is your assurance of custom quality, prompt service and superior performance.

Write today for details on Arrow's simplified fast service on "Specials"

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Chain Drag Conveyors. Honan-Crane Corp., 682 Wabash Ave., Lebanon, Ind., has released a four-page bulletin which presents a case history explaining and illustrating how the installation of two Houdaille chain drag conveyors on two quench-sizing machines minimized manual cleaning methods and conserved manpower at Muehlhausen Spring Division, Standard Steel Spring Co., Logansport, Ind. The bulletin also shows how conveyors operate continuously or intermittently, automatically removing scale from quench tanks without shutting down machinery.

Oilers. A 20-page three-color catalog issued by Eynon-Dakin Co., 9900 Freeland Ave., Detroit 27, Mich., fully describes and illustrates its line of "Hy- Car" oilers, oil cups, vent tubes, tube forms, and assemblies.



Exclusive vise grip jaw runs full length of cutting channel ... hugs bit so it can't rock, chatter, slip, sag or break ... permits faster feed, deeper cuts! Holds all sizessquare, round, undersize or narrow bits for cutting off or special forming operations.

Also available with 15° cutter channel for H.S.S. tool bits.

For complete information call your Clark Cutter Jobber now or write Factory B

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Manufacturers of Precision Cutting Tools



COMPLETE LINE OF PRECISION INSTRUMENTS

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Custom built to fit all All bearing surfaces

Smooth, sensitive control with Pilot wheel drive through twin gears and racks.

mechanism hardened, assuring accuracy.

Manufacturers of the most complete line of Lathe Turrets in the country. Send for Catalog No. 50A.

ENCO Manufacturing Co., Dept. 1122 4524 W. FULLERTON AVE., CHICAGO 39, ILL.



Reasonable Deliveries

Metalworking Machines. A completely new 32-page catalog describing how Di-Acro metalworking machines perform a wide variety of forming, cutting, and punching operations in medium and lightweight materials has been released by O'Neil-Irwin Mfg. Co., 576 Eighth Ave., Lake City, Minn. Printed in two colors, the catalog features the arrangement of machine specifications and material-forming capacities in tabular form for quick, ready reference by the reader. Additional features include photographic case histories of how numerous companies are applying "Die-less Duplicating" techniques to their particular problems,

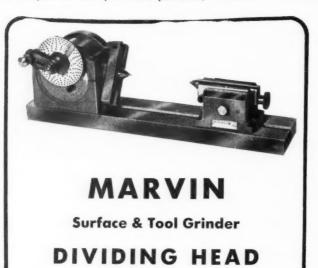
photos and descriptions of new and improved products, a listing of accessories, and complete information on both the Di-Acro Engineering Service Offer and the Di-Acro Warranty Agreement. Seven basic Di-Acro machines, including benders, notchers, brakes, punch presses, rod parters, rollers, and shears, which are available in 36 sizes, are fully described.

Thread Rolling Attachment. A fourpage two-color bulletin (No. 1-20) released by Reed Rolled Thread Die Co., Worcester, Mass., fully describes and illustrates its Series G2A Thread Rolling Attachment which is available in three

sizes for use on automatic screw machines and turret lathes. Information on features, as well as tables, is included.

Single - Spindle Disc Grinders, A 16-page two-color catalog (No. S-52) issued by Gardner Machine Co., 428 E. Gardner St., Beloit, Wis., fully describes and illustrates the complete line of Gardner single-spindle disc grinders designed for flat surface grinding operations. Information on available tooling and attachments is included.

"The Bliss Deferred Payment Plan" is the subject of a four-page two-color booklet published by E. W. Bliss Co., Canton, Ohio. Describing in detail how Bliss power presses may be purchased under the plan, the booklet presents six time periods for deferred payment along with examples of how monthly payments and interest charges are determined.



No. D-1435

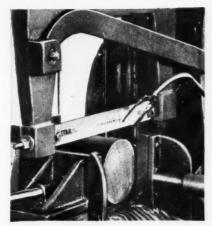
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The name of your nearest distributor.

ARVIN Machine Products Inc.

414 FORD BUILDING . DETROIT 26, MICHIGAN



# best metal cutter... real cost cutter... STAR "Moly"8 High Speed **POWER Hacksaw Blades**

To cut your initial power hacksaw blade costs at least 15%, tell your Distributor you want STAR "Moly" High Speed Power Blades.

STAR "Moly" Blades give you an extra dividend, too-cutting that's been proved

faster and more efficient.

Over the years, quality above all has made STAR Blades industry's preferred blade-top quality steel, carefully heat treated, manufactured on specially designed equipment, to give you fast, economical cutting and long blade life.

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### CLEMSON BROS., Inc. MIDDLETOWN, N.Y., U.S.A.

Makers of Hand and Power Hack Saw Blades, Frames, Metal Cutting Band Saw Blades and Clemson Lawn Machines.



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# a Reltool Cutter for Every Milling Operation...

Reltool offers a Full Range of Milling Cutters in all Types and Sizes for every standard milling operation, and for many special applications. This includes Keyseat Cutters - both Shank and Arbor Types; Plain and Heavy Duty, Side and Half-Side, Staggered Tooth, Helical, Angle, Shell End, Singleand Double-Angle, T-Slot-Straight and Taper Shank, Dovetail — 45° and 60° Angle. Convex, Concave and Corner Rounding Milling Cutters are available in both the Old Standard and in the New M.C.T.I. Standards.

The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks

- all types Screw Slotters Tool Bits Specials.



4540 W. BURNHAM ST. . MILWAUKEE 46, WIS.

Motors, Drives, Controls, and Generators. A four-page two-color illustrated bulletin (No. A-2703) released by Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio, describes its line of a.c. and d.c. motors, adjustable speed drives, electronic controls, regulators, motor generator sets, and generators.

Metal Slitting and Slotting Saw. A twocolor catalog illustrating and describing the "Woodsman" Carbide-Tipped Metal Slitting and Slotting Saw has been issued by North American Products Co., 3100 W. Cherry St., Milwaukee 8, Wis. Pertinent information and operating data regarding the operating characteristics and applications of the saw are included.

Cylindrical Grinding Wheels. A fourpage two-color illustrated folder released by The Sterling Grinding Wheel Division of The Cleveland Quarries Co., Tiffin, Ohio, describes its line of cylindrical grinding wheels created to meet special demands of specific jobs. Specifications for choosing a wheel for a particular job are included.

Height Gage. A four-page two-color circular (No. 555) issued by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., fully describes and illustrates the "Electrolimit" Height Gage which is available with 12 or 24-inch column stands. Specifications and a drawing of the gage head are included.

Diamond Lapping Compound. A multicolored brochure issued by J. K. Smit & Sons, Inc., Murray Hill, N. J., describes and illustrates its "Mirra-Lap" Diamond Lapping Compound. Tables showing the variety of grades and individual uses for each grade, as well as illustrations of applicators and tubes, are included.



LAWRENCE H. COOK, INC. 67 Massasoit Ave. E. Providence 14, R. I. Quenching Oils. An eight-page twocolor illustrated booklet released by Industrial Products Department, Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa., provides helpful information on quenching oils which are said to allow normal agitation and assure a uniform high hardness in every piece quenched. Illustrations showing Sun quenching oils in use are included.

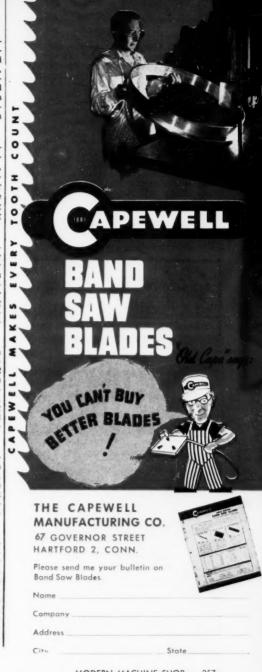
Cut-Off Tool. A two-color folder released by Cir-Cut Division of The New Britain Machine Co., New Britain, Conn., fully describes and illustrates its new cut-off tool which features a semi-circular disc-type blade with the cutting surface on the periphery. Information on setting up, operation, regrinding, and replacing the blade of the tool is included.

High-Speed Automatic Press. A fourpage two-color bulletin issued by Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y., describes and illustrates the Raskin "Velox" High-Speed Automatic Press which is available in four models with normal pressure ranging from 11 to 55 tons. Information on machine features and specifications are included.

Presses, Band Saws, and Shears. An eight-page two-color catalog (No. GC652) released by Famco Machine Co., 3122 Sheridan Rd., Kenosha, Wis., describes and illustrates its line of air presses, arbor presses, foot presses, power presses, drill presses, band saws, and squaring shears. Machine features are listed, and complete specifications for each type machine are provided.

V-Belt Drive Lathes. A four-page twocolor illustrated folder released by South Bend Lathe Works, South Bend 22, Ind., describes its 9-inch V-belt drive precision bench lathes and its V-belt drive "Light 10" precision bench lathes. Complete specifications for each type lathe are included.

Transfer Machine. A four-page twocolor bulletin released by The Avey Drilling Machine Co., Cincinnati 1, Ohio, fully describes and illustrates its 12-station "Line-O-Dex" transfer machine which is designed to automatically drill crankshafts. The bulletin also briefly discusses a special automatic indexing production drilling and tapping machine, a deep-hole drilling machine, and a standard sensitive and upright single or multi-spindle drilling and tapping machine.



Tool and Diemakers' Accessories. An eight-page two-color catalog released by The Producto Machine Co., 910 Housatonic Ave., Bridgeport 1, Conn., describes and illustrates its line of dowel pins, die springs, stripper bolts, and cap screws. Dimensional drawings and specifications are provided. Also described is the company's line of toolroom equipment, including a utility press, universal hand tapper, and toolroom vises.

Hydraulic Shop Presses. A 16-page two-color catalog (No. 313A) released by Rodgers Hydraulic, Inc., 7447 Walker St., Minneapolis 16, Minn., fully describes and illustrates its complete line of hydraulic shop presses which range in capacities from 60 to 400 tons. Information on accessories, as well as complete specifications, is provided.

Stub Drill Chuck. A two-color illustrated bulletin (No. 60224) released by Continental Tool Works, Division of Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich., describes its stub drill chuck which is designed for use in multiplespindle heads for drilling clearance holes. An exploded view and a cutaway drawing of the chuck are included.

Precision Cylindrical Grinding Machines. A 24-page two-color catalog (No. CG-53) released by Landis Tool Co., Waynesboro, Pa., illustrates and describes its complete line of precision cylindrical grinding machines, including universal grinders, plain grinders, and single-purpose high-production t v p e s. Operation sketches and brief specifications are included to show the application and size of each type machine.

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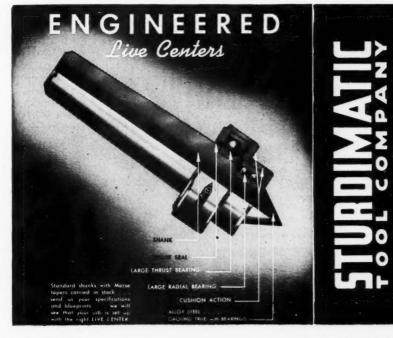
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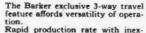
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Speed Reducers. A 20-page three-color bulletin (No. A-614-A) released by Dodge Mfg. Corp., Mishawaka, Ind., describes and illustrates its complete line of Torque-Arm speed reducers, as well as the Dodge overload release which is designed for use with the reducers. Cross-section views, engineering diagrams, and tables are included.

Internal-External Grinders. An eightpage two-color illustrated bulletin (No. 84A) released by Rivett Lathe & Grinder, Inc., Dept. MMSA-8, Brighton 35, Boston, Mass., fully describes its Model 84 internal-external grinder which has a capacity for grinding holes from the smallest up to 3 inches, with a maximum depth of 4 inches. Complete specifications, as well as information on accessories, are included.

Power Hack Saws. A four-page twocolor bulletin (No. 1052) issued by Sales Service Machine Tool Co., 2355 University Ave., St. Paul 4, Minn., describes and illustrates Keller Power Hack Saws which are available in ten models to meet cutting requirements up to 9 x 9inch capacity. Specifications for each model, as well as data on adjustable frame guides, pressure feed controls, and stock rests, are included.

Drilling Machine. A two-color catalog sheet (No. 70) released by Sibley Machine & Foundry Corp., 37 E. Tutt St., South Bend 23, Ind., describes and illustrates the Model MC-20 two-spindle drilling machine which has a capacity of 1½ inches in mild steel and the Model ME-25 three-spindle drilling machine which features a 21½-inch swing and variable speed drive. Complete specifications are provided for both models.

Reverberatory Furnace. A four-page two-color illustrated bulletin (No. C-90) issued by Eclipse Fuel Engineering Co., Rockford, Ill., fully describes the Eclipse Sklenar Reverberatory Furnace which is designed to melt iron, brass, aluminum, copper, nickel copper, and other alloys and which requires only 10 to 20 minutes initial preheating. Dimensions and specifications for each model are provided.

Molybdenum Disulfide Lubricant. A four-page two-color bulletin issued by Bel-Ray Co., Inc., Green Village Rd., Madison, N. J., describes the features of "Anti-Seize" Molybdenum Disulfide Lubricant which is said to prevent seizing and galling at bearing pressures of over 100,000 p.s.i. and at temperatures below sub-zero and up to 750 deg. Fahrenheit.

Stub Reamers and Floating Holders. A four-page two-color catalog (No. 552) issued by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., describes and illustrates its line of stub screw-machine reamers and floating holders designed for use in reaming operations requiring short reaming tools. Size and capacity tables for both the reamers and the holders are included.

Steel Shop Equipment. A four-page two-color illustrated bulletin released by Standard Pressed Steel Co., Jenkintown, Pa., fully describes its entire line of Hallowell steel shop equipment, including steel workbenches, cabinet benches, and SPS' recently developed multiple unit benches with cabinet and drawer-section pedestals for storage. Also described are bench legs, drawer tier units, shop desks, steel carts, tool stands, tool carriers, portable cabinets, posture stools, and knock-down adjustable stools. Data on material, color, dimensions, and snipping weight are included.

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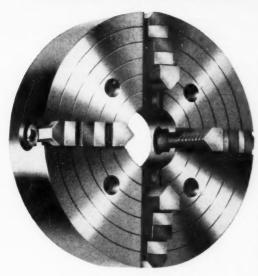
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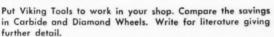
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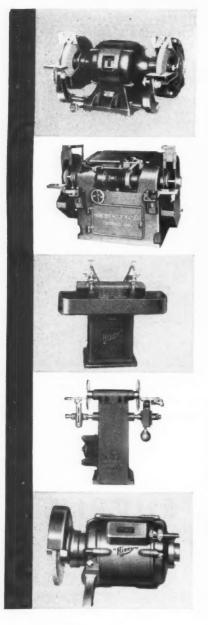
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### the last word

### The Shape of Things to Come

BIGGER and better, the by-word of many a consumer item sales pitch, is not alien to the metal manufacturing field. For years the trend has been toward larger equipment designed to more effectively produce metal parts. We have witnessed the advent of the transfer type machine and watched it grow from units of comparatively short length to applications of almost unlimited length. We have observed the building of planer-type horizontal boring, drilling and milling machines weighing more than 175 tons. We have come to expect things to be done in a big way when it comes to metalworking operations.

Accustomed as we have become to viewing gigantic equipment, however, we were totally unprepared for the revelations made one evening last month at a Dayton ASTE Chapter meeting by officers in charge of the heavy press development program at Wright field, and executives from the E. W. Bliss and Kaiser Aluminum Companies. While mentioning a total of seventeen presses ranging from 8,000 to 50,000 ton capacities under contract with six companies engaged in the military's Heavy Press Development Program, these men confined most of their remarks to the 35,000 ton capacity press now under construction at the Bliss plant at Canton, Ohio.

E. A. Irwin, General Sales Manager of E. W. Bliss Company, compared the 72-foot height of the press with that of a five story building. Its 6,000 ton weight is comparable to the weight of a 300-foot steamship, the combined weights of 3,000 standard automobiles, or all of the 70,000 people that can be crammed into Yankee

Stadium to see a ball game. A good sized room 24 feet x 12 feet by 11 feet high could be placed in the die area of this press.

R. F. Moore of Kaiser Aluminum & Chemical Corporation explained that the press under construction, as well as one of 25,000 ton capacity, will be used primarily for making large aluminum and magnesium forgings such as aircraft wing spars which are twenty to thirty feet in length. At present the construction of wing spars involves the assembly of many component parts. One-piece forgings will enable aircraft manufacturers to considerably reduce the assembly time, weight and materials now required.

It is interesting to speculate on the possible peace-time uses for these mammoth presses now under construction. Perhaps they will be applied to the manufacture of some present-day consumer product or perhaps to some product or products yet undreamed. Whatever their application, it is safe to assume that they present a challenge which can only be met in terms of "Bigger and Better" imagination.

### The Best of the Season to All

The members of the staff of Modern Machine Shop wish to take this opportunity to express their appreciation to the many friends and loyal supporters who make the publishing of this magazine possible. Their wish is that all of you may enjoy the best of health and happiness this Christmastide and prosperity during the coming year.

Fred W Vogel



Swan E. Bergstrom



Herbert L. Tigges



M. A. Hollengreen

### National Machine Tool Builders Elect New Officers At Annual Meeting

SWAN E. BERGSTROM, vice president, The Cincinnati Milling Machine Co., Cincinnati, Ohio, was elected president of the National Machine Tool Builders' Association at its 51st Annual Meeting held on November 12, 13, and 14 at The Greenbrier Hotel, White Sulphur Springs, West Virginia.

Herbert L. Tigges, executive vice president, Baker Brothers, Inc., Toledo, Ohio, was elected first vice president, and M. A. Hollengreen, president, Landis Tool Co., Waynesboro, Pa., was elected second

vice president and director. Francis J.
Trecker, president, Kearney & Trecker
Corp., Milwaukee, Wis., was elected
treasurer.

New directors elected, in addition to Mr. Hollengreen, were: J. C. Cotner, president, The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, and Alan C. Mattison, president, Mattison Machine Works, Rockford, Illinois.

Tel Berna was re-elected general manager of the association, and Mrs. Frida F. Selbert was re-elected secretary.



Francis J. Trecker



J. C. Cotner



Alan C. Mattison

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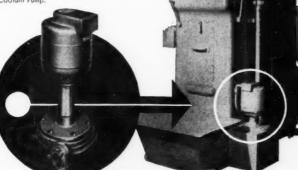
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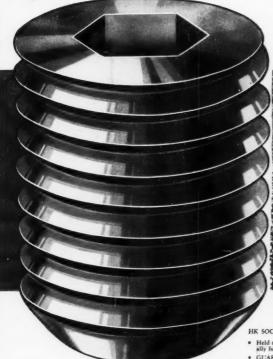
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